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ORIGINAL ARTICLES

THE FUNCTION OF TOOTH FORM

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IN making a study of the various forms of the teeth as found in man and lower animals, we can not help but be impressed that the form of the tooth has had a definite relation to the function. We may go so far as to say that a tooth performs a certain function because it has assumed a certain form. The importance of the function of the tooth as related to its shape is so great that we find the very nature of animals has been forced to conform to a food made suitable by the shape of a tooth. In the evolution of the dental apparatus, as various forms of teeth have made their appearance, it has been necessary for the animals to adopt a class of food which can be utilized by that tooth, or the animal became an extinct species. It is a well-known fact that the early forms of teeth were simply conical teeth, some of which were long cones, others short and flat. Even in the dental apparatus which was characterized by conical teeth, we find the shape of the tooth or the cone has had a decided bearing upon the nature of the animal. Taking the carnivorous fishes of which Fig. 1 is an illustration, you will note first the long, sharp, conical teeth located on the mandible which are for the purpose of prehension. These teeth have performed this particular function because they were particularly shaped for the purpose. In considering Fig. 2 one will notice that the teeth which are located on the palate and vomer are also long and conical, but have taken a slightly different shape and occupy a different position on the vomer and palate. As a result of this, the teeth in the upper jaw are not prehensile teeth, but are used entirely for deglutition, and consequently the only function which they perform is to assist the animal in swallowing food. In this case we find conical teeth which have the same general form, but which are slightly different, and as a result of that slight difference, perform different functions. As the conical tooth has been modified from the long, slender tooth which performs the functions of prehen-

sion and deglutition, to the flat tooth shown in Fig. 3, which performs the function of crushing, we can readily see how the form of the tooth has influenced its function. The form of the tooth has changed the entire nature of the animal

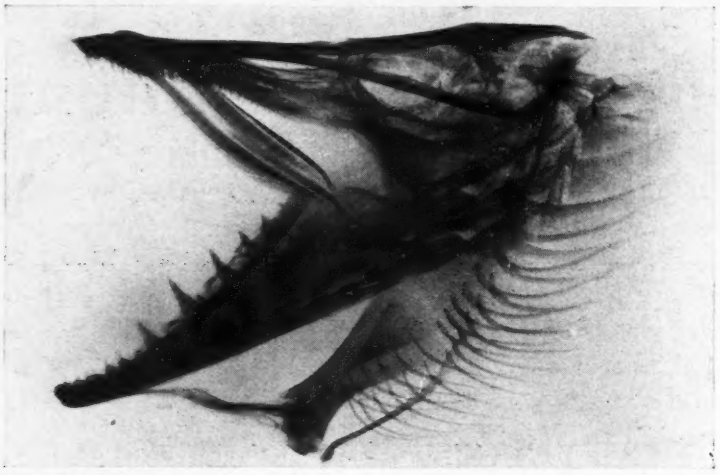


Fig. 1.—Radiograph of head of Pickerel, showing acrodont ankylosis. (By Dr. E. H. Skinner.)

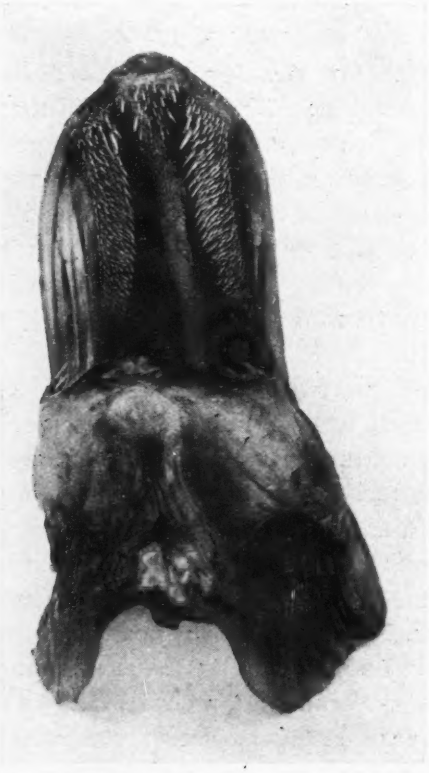


Fig. 2.—Teeth of Pickerel (*Esox lucius*), showing teeth on vomer and palates.

and such an animal as is shown in Fig. 3, which is a myliobatis, could not utilize the same class of food as the fish shown in Figs. 1 and 2.

Fig. 4 shows another form of the tooth which performs, necessarily, a different function. In this specimen, we see the erupting rows of teeth superim-

posed one upon the other in such a manner as to form a cutting edge. These teeth are a continuous succession, nevertheless, they make their appearance in such a manner as to form a cutting apparatus and consequently the entire dental apparatus forms an organ of incision. The function of these teeth is con-

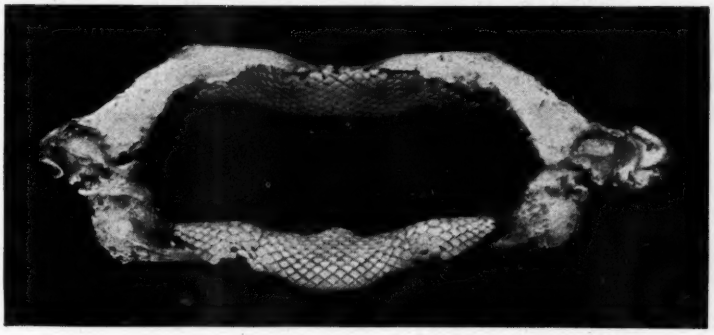


Fig. 3.—Myliobatis, showing crushing teeth.

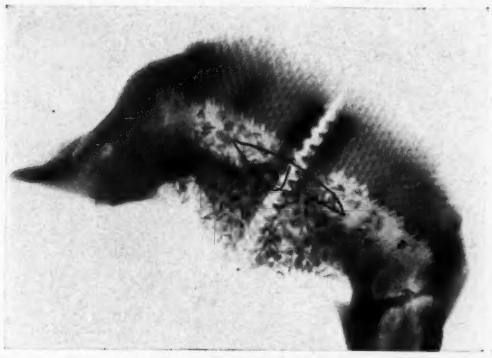


Fig. 4.—Roentgenograms of jaws of Parrot-fish (*Scaridæ*), showing incision by rows of teeth. (By Dr. E. H. Skinner.)

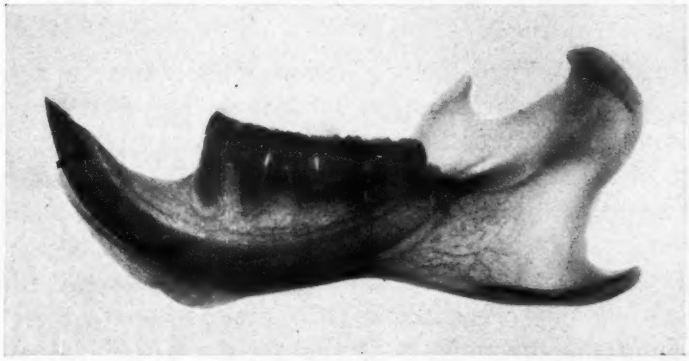


Fig. 5.—Roentgenogram of jaw of Woodchuck (*Arctomys monax*), showing long incisor and attachment of same. (By Dr. E. H. Skinner.)

trolled entirely by the form and arrangement, and any other use of these teeth would be absolutely impossible. In Fig. 5 we have the function of incision performed by a single tooth which is so shaped as to make that particular function possible and very efficient. The incisors of the rodent, of which Fig. 5 is a specimen, not only are shaped in such a manner as to perform a function of

incision, but the dental tissues are arranged so as to make the act of incision more efficient than it would be if arranged in the usual manner. The enamel is much thicker on the labial side of the tooth than it is on the lingual side, as a result of which the lingual side wears down more rapidly and the labio-incisal edge always presents a keen cutting edge. The tooth is also of continuous growth, developing from a persistent germ, which makes it necessary that there be some means of protecting the germ against the stress of mastication during the act of incision. It will be observed that the tooth is an arc of a circle and the greatest amount of stress falls on the incisal edge, which displaces the tooth downward, resulting in the tooth being supported by the attachment to the peridental membrane, and the heavy buttress of bone which is seen on the lingual side of the tooth. This downward pressure on the incisal edge of the tooth supported by the alveolar process and peridental membrane on the inciso-lingual border will have a tendency to raise the apical portion of the tooth occlusally, which in turn is held in position by attachment of fibers of the peridental mem-

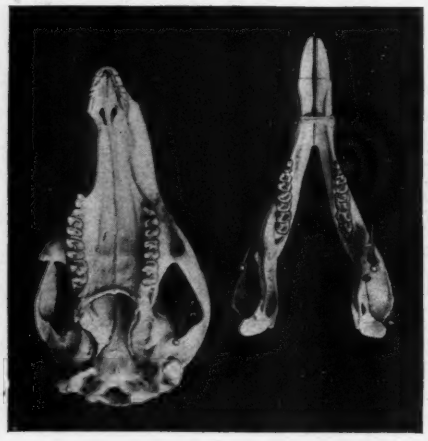


Fig. 6.—Teeth of Kangaroo (*Macropus giganteus*).

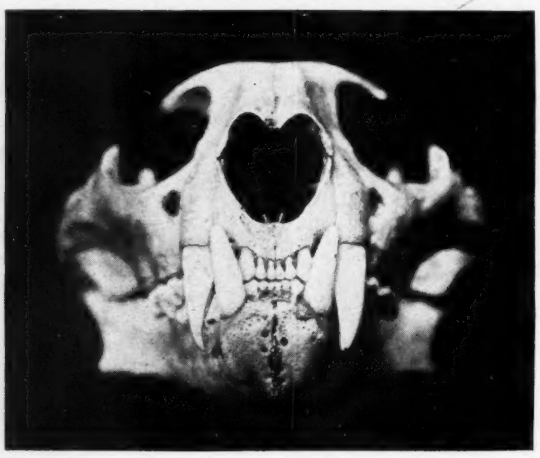


Fig. 7.—Teeth of Mountain Lion. Front view.

brane at the distal portion of the tooth. In fact, the entire shape of the tooth not only gives it a particular function, but it is so shaped as to give it a proper support and consequently increase its efficiency.

The teeth in the anterior portion of the mouth which are known as incisors have been developed for the purpose of cutting, but we find a large number of varieties have developed and all of them have necessarily been used in a different manner to perform the act of incision. Fig. 6 shows the incisors of the kangaroo which are very efficient and which get their particular efficiency from the peculiar form and shape of the tooth. Of the upper incisors we have six, three on each side; of the lowers only two, one on each side. The lower incisors grow directly outward and are so shaped that the mesial surfaces assume the form of scissor blades. As the result of the incisors being so shaped, the mandible has a special movement which makes possible the use of these teeth for cutting off grass. This makes a dental apparatus so highly efficient that the kangaroo is able to live in regions where other herbivorous animals would starve to death. In Fig. 7 we have an illustration of a mountain lion

which shows incisors that have fallen from their original use and function. The incisors of the lion are very greatly degenerated because of their shape. In fact, so far as being organs of incision, they are practically useless, and have taken on the function of bone-scrapers instead of incisors. Associated with them we find the large canines which were originally teeth of prehension, but which have taken on such a size that they have become weapons of warfare, and consequently are used by the animal to secure its food by physical combat. The importance of the large canines as weapons of warfare is clearly emphasized by the strong manner in which they are embedded in the maxilla and mandible. They are sufficiently large as to indicate the characteristics of the animal. As these animals are meat eaters, a highly effective incisal apparatus is necessary, which has been developed from the molars and premolars, as can be seen in Fig. 8. In the carnivora the function of incision has been usurped by the posterior teeth which have developed into cutting teeth which are very effective

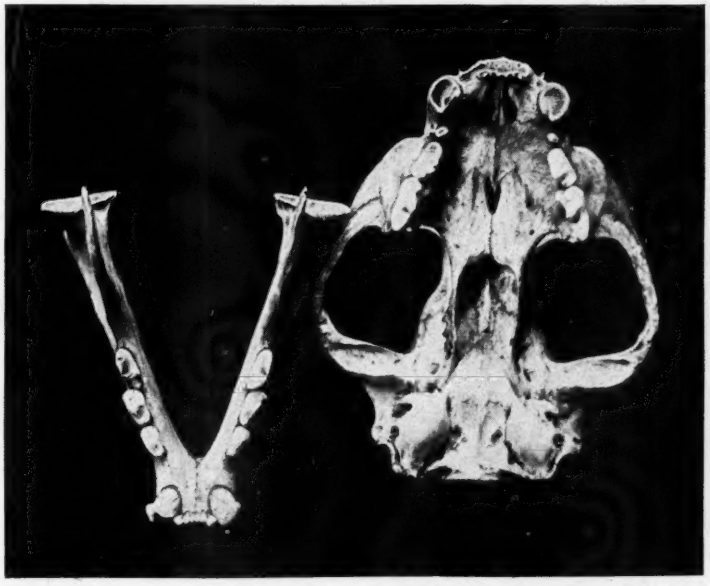


Fig. 8.—Teeth of Mountain Lion. Occlusal view, showing arrangement of premolars and molars to perform incision.

and which perform all the functions intended to be performed by the incisors. In fact, with a tooth so formed as shown in Fig. 8, it would be absolutely impossible for it to perform any other function than that of incision. So, here again, we see the shape of the tooth most completely and definitely influencing its function, in fact, controlling practically the entire nature of the animal.

In calling attention to the molars and premolars of the mountain lion I wish to impress the importance of the cusp relation. It will be seen that with the long canine a horizontal or lateral movement of the mandible is impossible, a vertical movement being all that can occur. The long cusps of the molars and premolars also hold the teeth in position and, consequently, there is very small approximal contact. Not only is the development of the cusp important as regards the tooth, but in this case it is important in holding the tooth in the proper position in the dental arch so it can perform its function. We find

that a slight modification of the shape of the tooth will not only influence the function of that tooth, but will influence the entire nature of the animal.

Fig. 9 is the dental apparatus of the hyena in which the canines have become reduced in length as compared to the mountain lion. The cusps of the molars and premolars are short and heavy. As the result of this, the hyena has assumed a diet in which the teeth perform the function of bone crushers, and the bone supporting the teeth has become heavy and dense. Here is shown a decided example of the form of the tooth controlling the function of

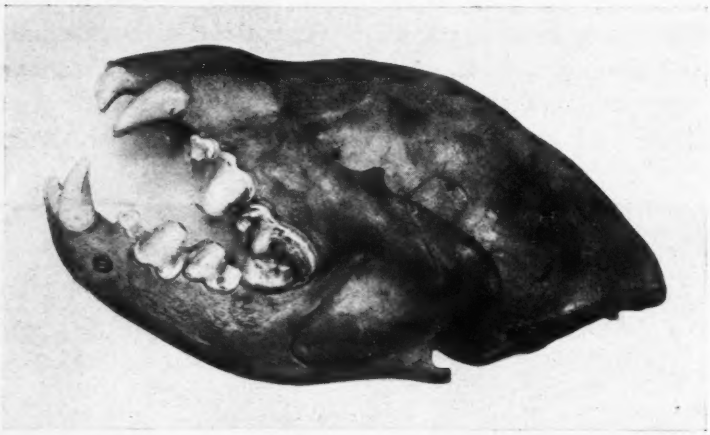


Fig. 9.—Teeth of *Hyena crocuta*. Premolars and molars used for crushing.

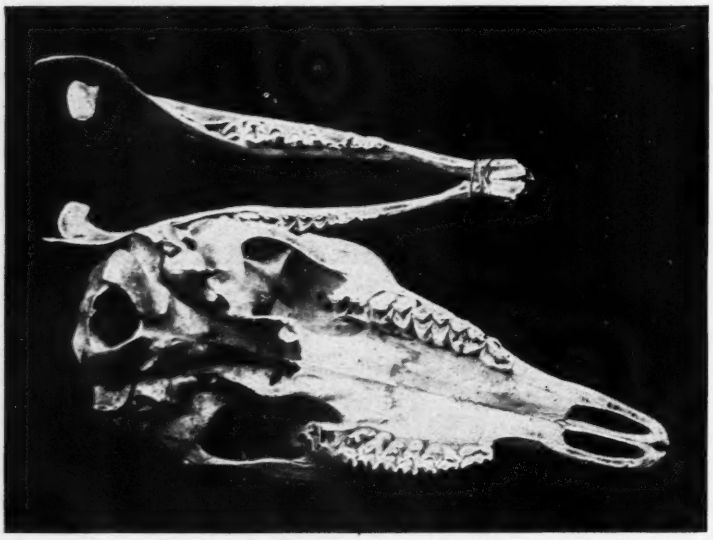


Fig. 10.—Occlusal view of teeth of Antelope (species unknown). Premolars and molars used for grinding.

the tooth and also controlling the food habits and nature of the animal. In passing from the mountain lion to the hyena we have an example of the importance of the development of the canine as related to the nature of the animal, and we find that is true in practically all animals. In passing to the herbivorous animals that do not develop the canines, we find the nature of the animal has changed so far as physical warfare is concerned, and likewise the

food habits have changed. Owing to the shape of the teeth of the herbivorous animals, they have been forced to assume a different diet; and also owing to the change in their teeth, they have been forced to assume a different means of protecting themselves.

Fig. 10 shows the occlusal view of the dental apparatus of an antelope.

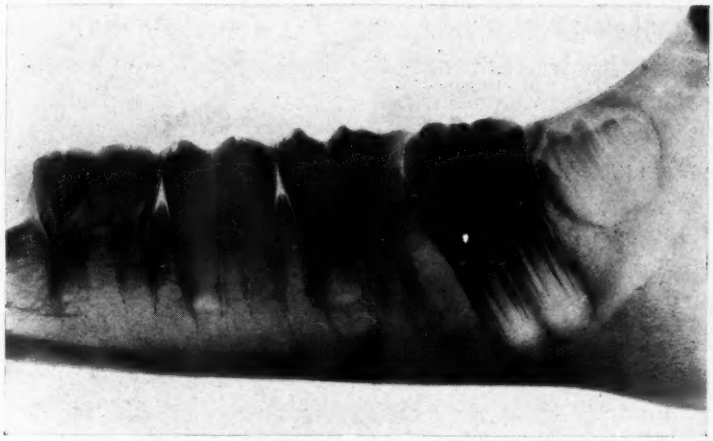


Fig. 11.—Roentgenogram of mandible of a young horse, showing proximal contact of the teeth. (By Dr. E. H. Skinner.)

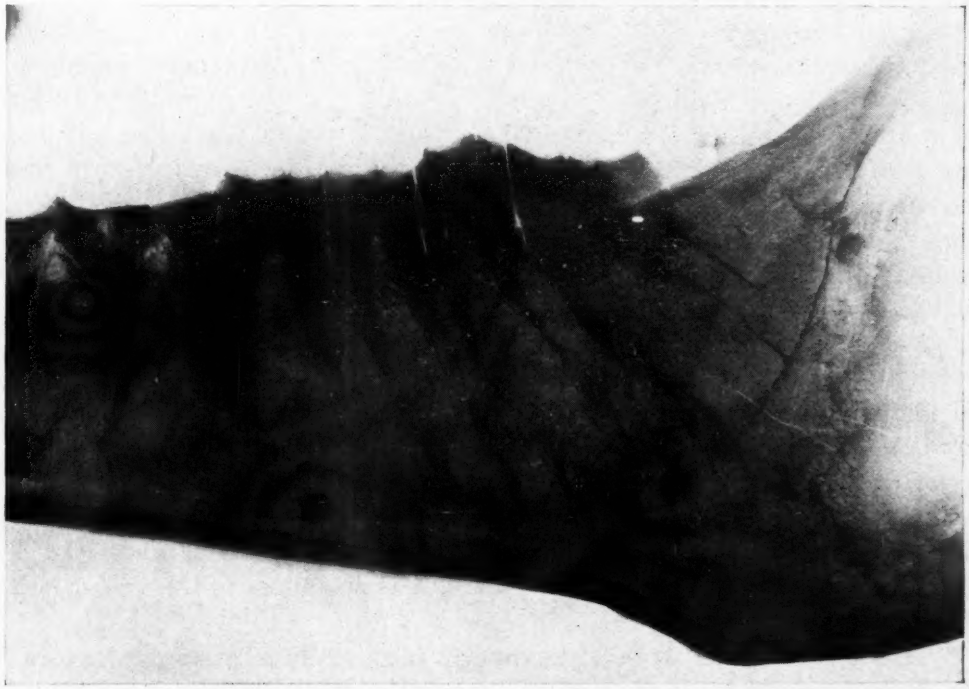


Fig. 12.—Roentgenogram of mandible of an old horse, showing how the proximal contact has been maintained as the teeth were worn down. (By Dr. E. H. Skinner.)

There are no canines present in either the upper or lower arch, and the incisors are developed only in the mandible. The molars and premolars are wide and flat, the occlusal surfaces of which are thrown up into regular folds and grooves, the cusps being short as compared to the carnivorous tooth, but the proximal

contact is very large and firmly supports the tooth. It is the proximal contact of the upper and lower teeth which holds them in a definite position. The teeth are so shaped that the mesio-buccal angle of the maxillary tooth projects slightly beyond the disto-buccal angle of the tooth in front of it. On the mandibular teeth you will find the proximal contacts are just reversed and the disto-lingual angle of the anterior tooth projects to the lingual of the mesio-lingual angle of the tooth posterior to it. As a result of this arrangement the maxillary and mandibular teeth are supported against the stress of mastication which is brought to bear upon them during the lateral movement of the mandible. You will also notice that the shape of the tooth is such as to make a lateral movement of the mandible possible because the buccal surfaces of the maxillary molars are more occlusal than are the lingual surfaces, and the lingual surfaces of the lower molars are more occlusal than the buccal surfaces. This gives two inclined planes or slopes to the upper and lower teeth, one opposite the other but so arranged as to make a beautifully occlusal contact when the teeth are in occlusion. The various forms of the teeth are such as to render mastication highly efficient for the particular kind of food which the animal utilizes. The importance of the proximal contact for holding the teeth in position as related to the form of the tooth can be understood by studying Fig. 11, which is a radiogram of the jaws of a young horse. It will be seen how beautifully the teeth are approximated and how the first and second permanent molars are developing behind the deciduous molars, each one taking a beautiful proximal contact which is necessary to hold the tooth in proper position. We find the function of these teeth as related to form is very important because the teeth are of continuous eruption, the length of the crown greatly exceeding the length of the root. As the animal grows older and the crown is worn away, the tooth continues to erupt. As the crown is worn down, it necessarily follows that a smaller mesio-distal diameter of the tooth will finally occupy the occlusal plane, which makes it necessary for the entire dental apparatus to change in order that the proximal contact be maintained.

Fig. 12 shows a radiograph of an old horse, twenty-seven years of age, in which the teeth have been greatly worn down occlusally, with the result that they have continued to erupt and a narrower mesio-distal diameter of the tooth has been brought together. As this change occurred in the mesio-distal diameter of the teeth, the anterior teeth were forced to drift distally and the posterior teeth drifted mesially and in this manner the proximal contacts were maintained. This shows the importance of the tooth form and the proximal contact of the teeth as means of supporting them in the dental apparatus so they can perform their functions.

As we take up the study of the human teeth in the relation of the form to the function, we find that the form of the tooth as related to its function is more important than has been realized by a large number of practitioners. The teeth of man are divided into four groups: the incisors, canines, premolars and molars. We will only take up the consideration of one tooth of each group, and call attention to some chief forms and the functions which they perform in the masticating apparatus.

In considering the incisors of man, one of the first important functions as

related to tooth form is the function of the linguo- and labio-gingival marginal ridge. Fig. 13 shows that the labial surface of the incisor has the greatest amount of convexity at the gingival border, or the gingival third. This gingival convexity is for the purpose of protecting the gingival gum tissue, but is not so well developed as it is on the lingual side, because it does not have as important a function to perform. In the act of incision, the food slides along the lingual surface of the upper incisor until it comes to the point corresponding to the lingual fossa, at which place it is deflected backward or toward the

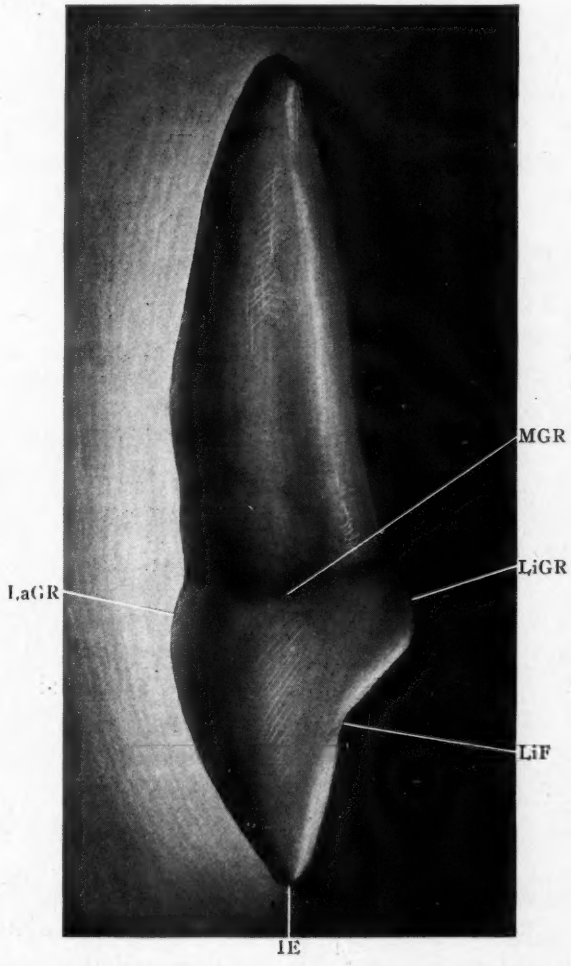


Fig. 13.—Mesial surface of the maxillary right central incisor. LaGR, Labio-gingival ridge; IE, Incisal edge; LiF, Lingual fossa; LiGR, Linguo-gingival ridge; MGR, Mesio-gingival ridge.

palate along the gingivo-lingual third of the lingual surface. At this point is a development of the linguo-gingival ridge that deflects the food away from the soft gingival tissue, which proves the function of the linguo-gingival ridge of the incisor is to protect the gingival tissues. However, we find the majority of artificial crowns are constructed without any attempt to restore the linguo-gingival ridge, with the result that after a crown has been placed upon the root; we very often observe that the gingival tissue recedes and the root becomes exposed. The shape of the crown is such that it does not protect the

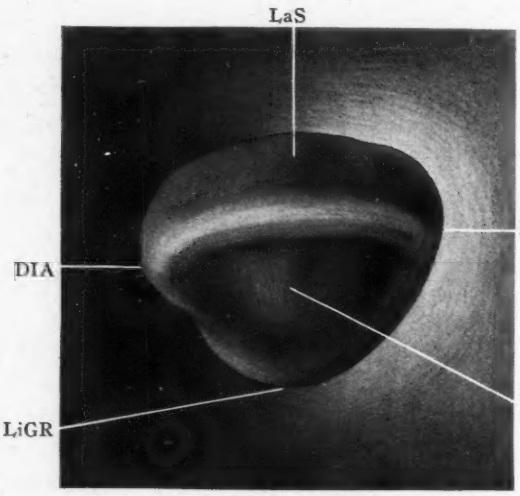


Fig. 14.—Incisal surface of the maxillary right central incisor. DIA, Disto-incisal angle; LiGR, Linguo-gingival ridge; LiF, Lingual fossa; MIA, Mesio-incisal angle; LaS, Labial surface.

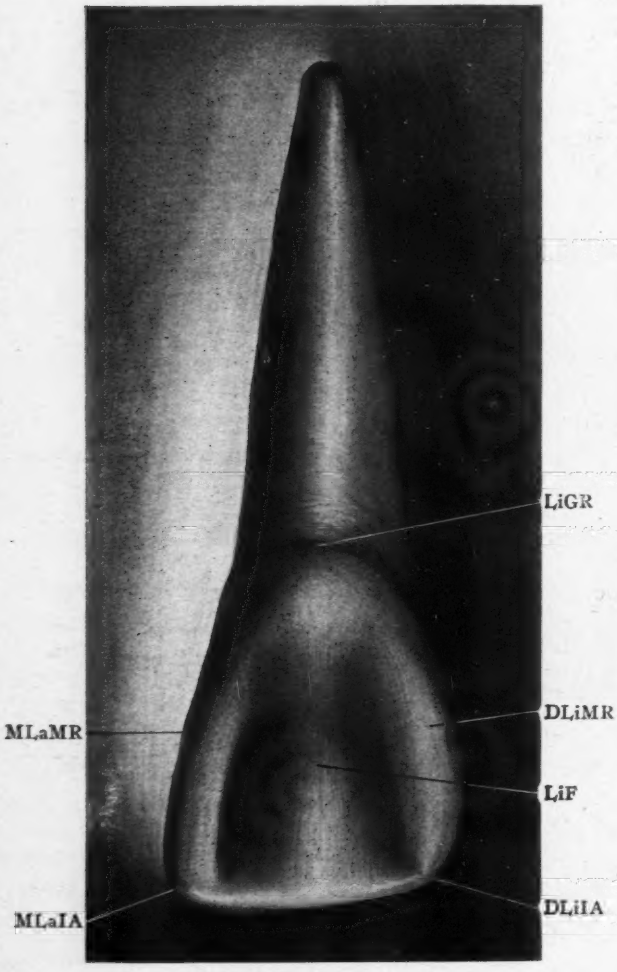


Fig. 15.—Lingual surface of the maxillary right central incisor. MLaMR, Mesio-labial marginal ridge; MLaIA, Mesio-labio-incisal angle; DLiIA, Disto-linguo-incisal angle; LiF, Lingual fossa; DLiMR, Disto-lingual marginal ridge; LiGR, Linguo-gingival ridge.

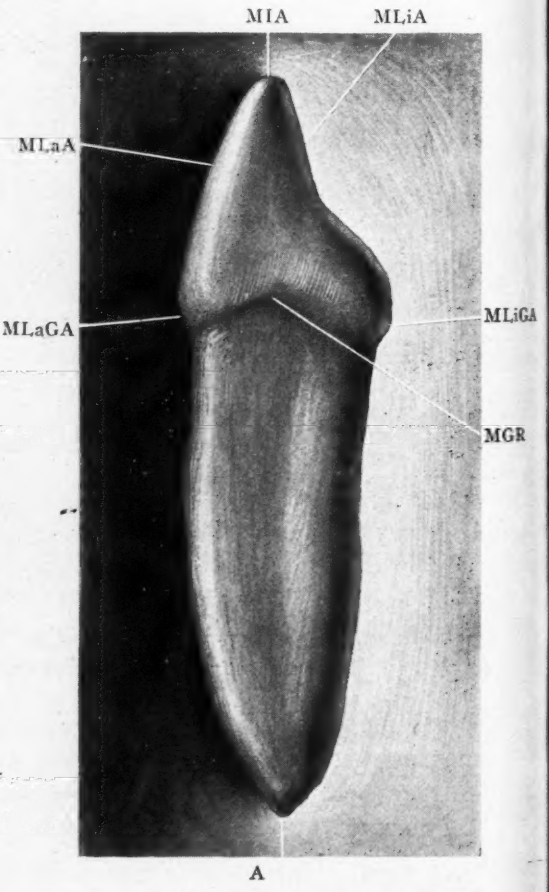


Fig. 16.—Mesial surface of the mandibular right lateral incisor. MLaA. Mesio-labial line angle; MLaGA, Mesio-labio-gingival angle; A, Apex of root; MGR, Mesio-gingival ridge; MLiGA, Mesio-linguo-gingival angle; MLiA, Mesio-lingual line angle; MIA, Mesio-incisal angle.

soft tissue, and consequently the soft tissue is crowded away from the root by the food during mastication.

Fig. 14 shows the incisal view of an upper central incisor which has been made by looking directly on the incisal edge of the tooth. The incisal edge is slightly nearer the labial than it is near the lingual, which allows for a large lingual slope extending from the incisal edge to the linguo-gingival ridge. You will also observe that there is a linguo-gingival ridge extending toward the linguo-gingival marginal ridge which is for the purpose of guiding the food toward the center of the tooth and keeping it away from the proximal embrasures of the teeth. The proximal surfaces of the tooth have contact points so arranged as to keep food from wedging in between the teeth. The proximal contact is very important and the shape is always such as to guide the food away from the proximal embrasures either into the oral cavity or out toward the lip where it can be returned to the teeth for further mastication.

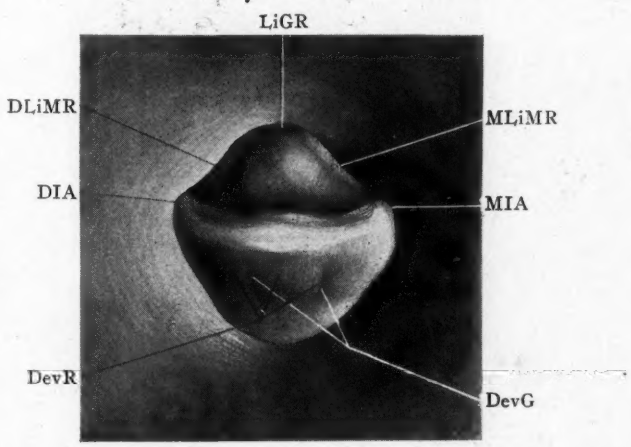


Fig. 17.—Incisal view of the mandibular lateral incisor. DLiMR, Disto-lingual marginal ridge; DIA, Disto-incisal angle; DevR, Developmental ridges; DevG, Developmental grooves; MIA, Mesio-incisal angle; MLiMR, Mesio-lingual marginal ridge; LiGR, Linguo-gingival ridge.

Fig. 15 shows a surface view of the maxillary central and shows the importance of the form of the lingual which also has to deal with the food being guided into the oral cavity. It will be observed that the proximal contact of the mesial side is nearer the occlusal surface than is the proximal contact of the distal side. While this may not be so important as regards function, nevertheless it is important when one considers the fact that the maxillary lateral incisor is a smaller tooth than the central and the mesial contact of the maxillary lateral proximates with the distal surface of the central.

We see a large number of beautiful restorations from the standpoint of mechanics, some are gold-foil fillings, others are inlays of gold or porcelain, which are made with the mesial and distal sides exactly the same. The operators had failed to realize the importance of tooth form from a functional and artistic standpoint.

Mandibular incisors of man present very nearly the same outline as regards function in relation to form as do the maxillary incisors. Fig. 16 is a view of the mandibular central incisor which shows the same labio-gingival ridge that there is on the maxillary incisor.

Fig. 17 shows the incisal edge of the mandibular central is near the center

of the tooth, which means there is a greater slope of the labial surface gingivally than there is in the maxillary incisor. The mesial and distal proximal contacts are so shaped as to deflect the food away from between the teeth and more toward the oral cavity than toward the cheeks. When we study the canine, we find a tooth in man, which to a certain extent, has lost its original function. The canines primarily were teeth designed for prehension, but in man the act of prehension has been usurped to a certain extent by the fingers, and the teeth are not used for prehension as they are in the lower animals. While the canine

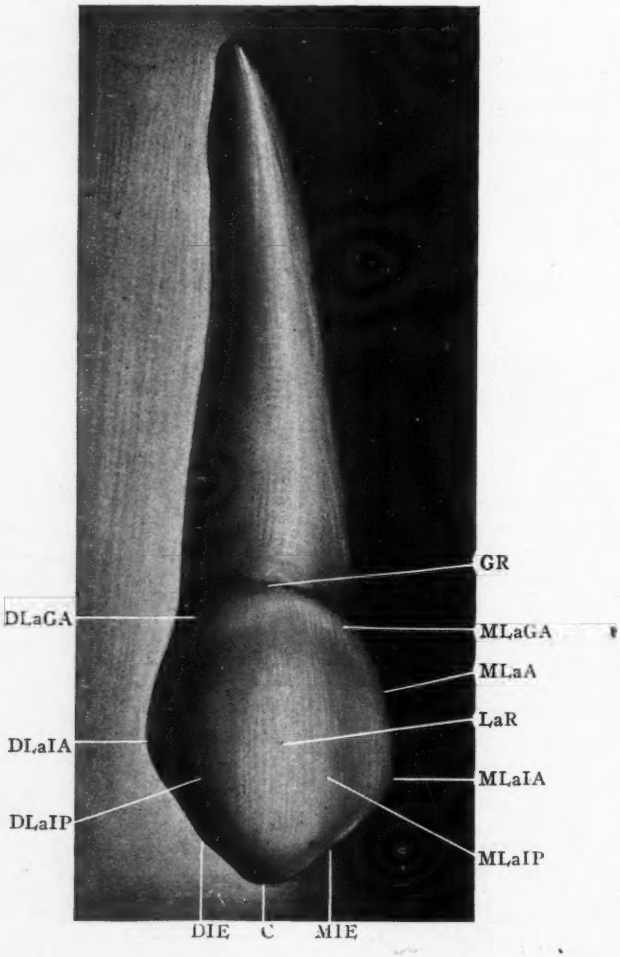


Fig. 18.—Labial surface of the maxillary right canine. DLaGA, Disto-labio-gingival angle; DLaIA, Disto-labio-incisal angle; DLaIP, Disto-labial inclined plane; DIE, Disto-incisal edge; C, Cusp; MIE, Mesio-incisal edge; MLaIP, Mesio-labial inclined plane; MLaIA, Mesio-labio-incisal angle; LaR, Labial ridge; MLaA, Mesio-labial angle; MLaGA, Mesio-labio-gingival angle; GR, Gingival ridge.

has lost a certain amount of its original function, it still presents a form which is very interesting, both as regards the remaining functions of the tooth and the esthetic value of the tooth form. There probably is no tooth in the mouth as difficult to reproduce as the maxillary canine if we consider the original function of the tooth form as well as the importance which the tooth bears from the esthetic standpoint. It has been evolved from an original conical tooth, but in being made to occupy the position which it holds in the human mouth,

various sides and angles have required a change which is different from that found in other animals.

In looking at the labial surface of the crown as shown in Fig. 18 you will observe that it presents five point angles which are the mesio-gingival, the mesio-incisal, the incisal, the disto-incisal and the disto-gingival. These five point angles on the labial surface are all different and the differences in shape must be maintained if we are to have the proper function and beauty of the tooth. The central developmental lobe of the canine is especially well formed which results in a large amount of convexity of the labial surface both mesio-distally

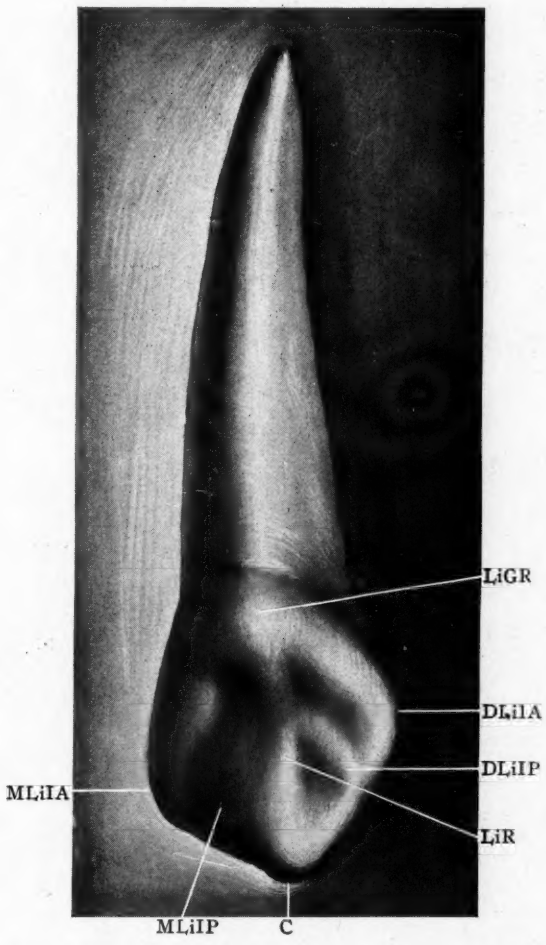


Fig. 19.—Lingual surface of the maxillary right canine. MLiIA, Mesio-linguo-incisal angle; MLiIP, Mesio-linguo-inclined plane; C, Cusp; LiR, Lingual ridge; DLiIP, Disto-lingual inclined plane; DLiIA, Disto-linguo-incisal angle; LiGR, Linguo-gingival ridge.

and bucco-lingually. The mesio-incisal angle of the labial surface is nearer the occlusal border than the disto-incisal angle of the labial surface. As a result of this the line angle extending from the mesio-incisal angle to the cusp is shorter than the line angle extending from the disto-incisal angle to the cusp. This gives a five-pointed labial surface, all points of which are different, and all of which are made by different lengths of line angles.

Fig. 19 shows the lingual surface of the maxillary canine, and one of the

first points to which our attention is directed is the extensive development of the linguo-gingival ridge, as well as the mesial and disto-lingual marginal ridges. There is a tendency for the lingual ridge to extend from the cusp of the tooth toward the linguo-gingival ridge, which may be marked by a fossa on both sides of the ridge, or which may be crossed by a lingual fossa, or which may be absent owing to the extensive development of the linguo-gingival ridge into a tubercle. However, it will be observed that the mesio- and disto-lingual marginal ridges are so shaped as to guide the food towards the central portion

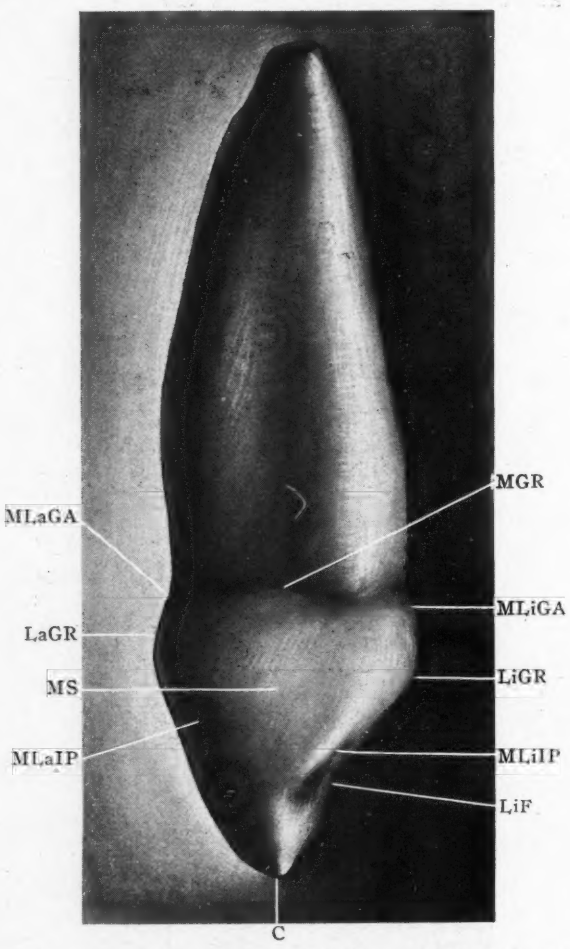


Fig. 20.—Mesial surface of the maxillary right canine. MLaGA, Mesio-labio-gingival angle; LaGR, Labio-gingival ridge; MS, Mesial surface; MLaIP, Mesio-labial inclined plane; C, Cusp; LiF, Lingual fossa; MLiIP, Mesio-lingual inclined plane; LiGR, Linguo-gingival ridge; MLiGA, Mesio-linguo-gingival angle; MGR, Mesio-gingival ridge.

of the tooth and the linguo-gingival ridge is so extensively developed as to guide the food away from the gingival gum tissue.

Fig. 20 shows the mesial surface of the maxillary canine which will give some idea of the manner in which the labial and lingual surfaces converge towards the cusp. It will also be seen than the linguo-gingival ridge on the labial and lingual side of the tooth is well developed and prevents the food from impinging on the gingival tissue. Owing to the excessive development of the mesial and distal proximal contacts, it will be seen that the crown of the tooth

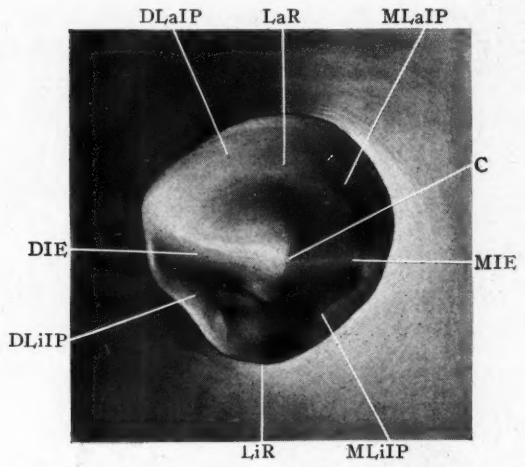


Fig. 21.—Incisal view of the maxillary right canine. DIE, Disto-incisal edge; DLiIP, Disto-lingual inclined plane; LiR, Lingual ridge; MLiIP, Mesio-lingual inclined plane; MIE, Mesio-incisal edge; C, Cusp; MLaIP, Mesio-labial inclined plane; LaR, Labial ridge; DLaIP, Disto-labial inclined plane.

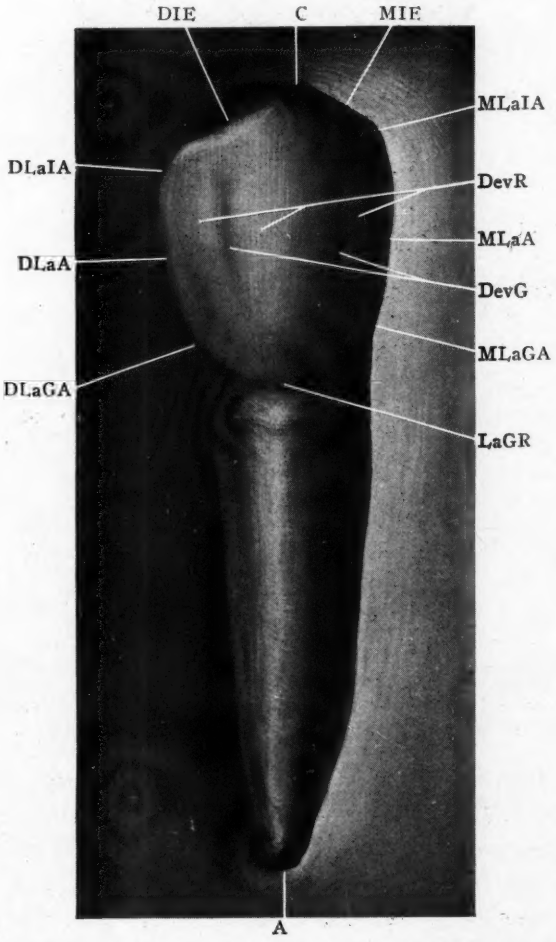


Fig. 22.—Labial surface of the mandibular right canine. DLaIA, Disto-labio-incisal angle; DLaA, Disto-labial line angle; DLaGA, Disto-labio-gingival angle; A, Apex of root; LaGR, Labio-gingival ridge; MLaGA, Mesio-labio-gingival angle; DevG, Developmental grooves; MLaA, Mesio-labial line angle; DevR, Developmental ridges; MLaIA, Mesio-labio-incisal angle; MIE, Mesio-incisal edge; C, Cusp; DIE, Disto-incisal edge.

is much wider through the proximal contacts than it is at the gingival border. This is produced by the mesial and distal surfaces of the upper canine converging towards each other lingually as well as gingivally, which makes the labial surface of the crown much wider than the lingual surface at the gingival border. This is a very important form owing to the position it occupies in the corner of the mouth, and also in regard to the deflecting of food away from the soft tissues during mastication. In making restorations of the upper canine there is a great tendency to fail to restore the gingival marginal ridges, and consequently there probably is no tooth that is crowned in which the

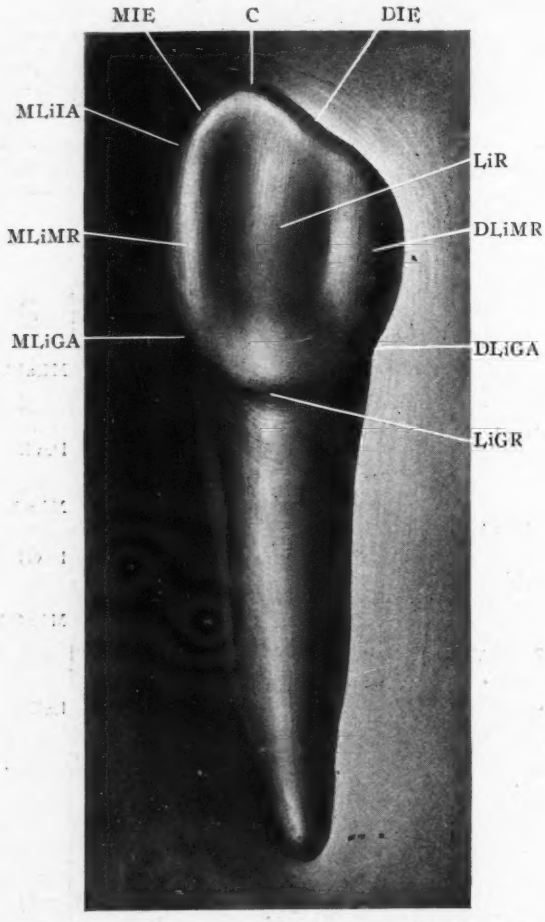


Fig. 23.—Lingual surface of the mandibular right canine. MLiIA, Mesio-linguo-incisal angle; MLiMR, Mesio-lingual marginal ridge; MLiGA, Mesio-linguo-gingival angle; LiGR, Linguo-gingival ridge; DLiGA, Disto-linguo-gingival angle; DLiMR, Disto-linguo-marginal ridge; LiR, Lingual ridge; DIE, Disto-incisal edge; C, Cusp; MIE, Mesio-incisal edge.

gum recedes as often as it does in the maxillary canine. Restorations involving the mesial and distal surfaces of the maxillary canine are difficult to make owing to the excessive development of the proximal contact points and the peculiar angle at which the surfaces join each other. In looking at the occlusal or incisal view of a maxillary canine (Fig. 21) it will be seen that the cusp of the tooth is slightly more toward the mesial than to the distal, and that the labial surface presents an even convexity in all directions. It will be seen that the lingual fossa of the canine is not so well developed as the lingual

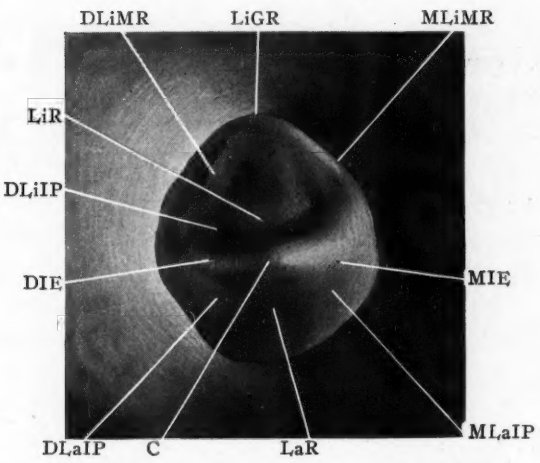


Fig. 24.—Incisal view of the right mandibular canine. LiR, Lingual ridge; DLiIP, Disto-lingual inclined plane; DIE, Disto-incisal edge; DLaIP, Disto-labial inclined plane; C, Cusp; LaR, Labial ridge; MLaIP, Mesio-labial inclined plane; MIE, Mesio-incisal edge; MLiMR, Mesio-lingual marginal ridge; LiGR, Linguo-gingival ridge; DLiMR, Disto-lingual marginal ridge.

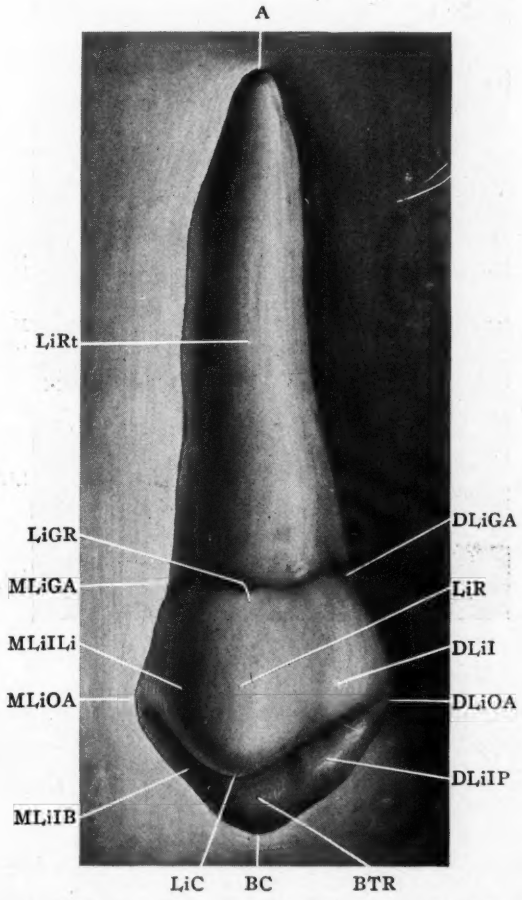


Fig. 25.—Lingual surface of the maxillary right first premolar. LiRt, Lingual root; LiGR, Linguo-gingival ridge; MLiGA, Mesio-linguo-gingival angle; MLiILi, Mesio-lingual inclined plane of lingual cusp; MLiOA, Mesio-linguo-occlusal angle; MLiIB, Mesio-lingual inclined plane of buccal cusp; LiC, Lingual cusp; BC, Buccal cusp; BTR, Bucco-triangular ridge; DLiIP, Disto-linguo-inclined plane of buccal cusp; DLiOA, Disto-linguo-occlusal angle; DLiI, Disto-lingual incline of lingual cusp; LiR, Lingual ridge; DLiGA, Disto-linguo-gingival angle; A, Apex of root.

fossa of the incisors, owing to the fact that the lingual ridge extending from the tip of the cusp to the linguo-gingival marginal ridge is, as a rule, very well developed in the upper canine. The form of the mandibular canine is very similar to that of the maxillary canine, with the exception that the mesial surface of the crown and the root is more nearly a straight line. The excessive width of the crown over the root is the result of the development of the convexity of the distal surface, which results in the distal surface of the crown projecting beyond the distal surface of the root much farther than the mesial surface. The tip of the cusp is nearer the mesial surface, and the mesio-incisal edge of the mandibular canine is shaped to occlude with the lingual sur-

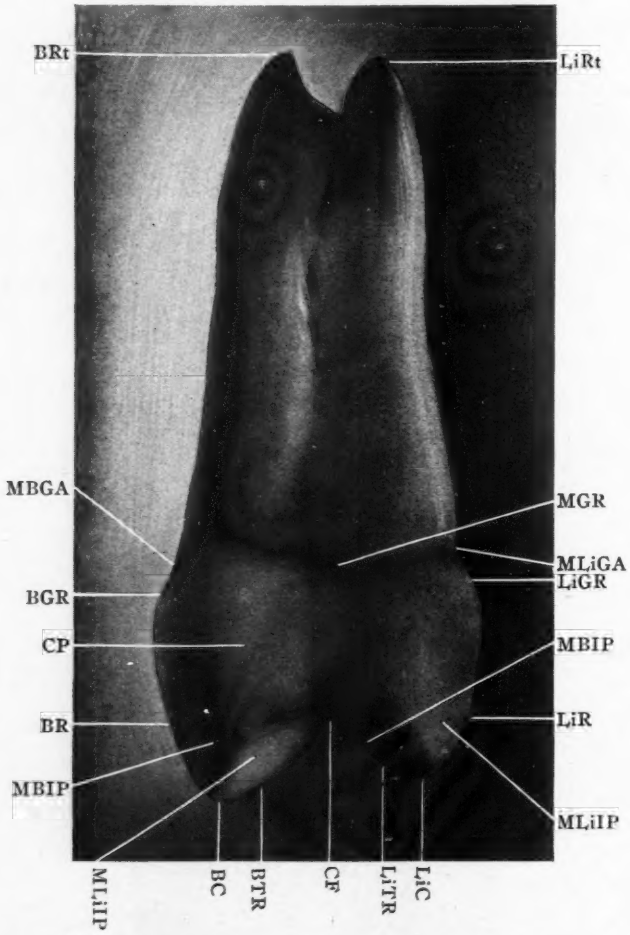


Fig. 26.—Mesial surface of the maxillary right first premolar. BRt, Buccal root; MBGA, Mesio-bucco-gingival angle; BGR, Bucco-gingival ridge; CP, Contact point; BR, Buccal ridge; MBIP, Mesio-buccal inclined plane; MLiIP, Mesio-lingual inclined plane; BC, Buccal cusp; BTR, Buccal triangular ridge; CF, Central fossa; LiTR, Linguo-trianguiar ridge; LiC, Lingual cusp; MLiIP, Mesio-lingual inclined plane; LiR, Lingual ridge; MBIP, Mesio-buccal inclined plane; LiGR, Linguo-gingival ridge; MLiGA, Mesio-linguo-gingival angle; MGR, Mesio-gingival ridge; LiRt, Lingual root.

face of the maxillary lateral incisor. The disto-incisal edge of the mandibular canine occludes with the mesio-linguo-incisal edge of the maxillary canine, and consequently must be so shaped as to fit with that surface. (Fig. 22.)

Fig. 23 shows the lingual surface of the mandibular canine and the greater width of the disto-incisal angle as compared to the mesio-incisal angle. The

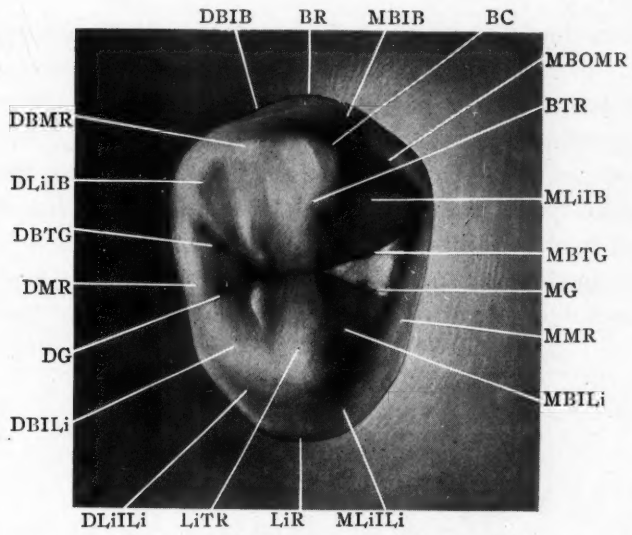


Fig. 27.—Occlusal surface of the maxillary right first premolar. DBMR, Disto-buccal marginal ridge; DLiIB, Disto-lingual inclined plane of buccal cusp; DBTG, Disto-bucco-triangular groove; DMR, Distal marginal ridge; DG, Distal groove; DBILi, Disto-buccal inclined plane of lingual cusp; DLiILi, Disto-lingual inclined plane of lingual cusp; LiTR, Linguo-triangular ridge; LiR, Lingual ridge; MLiILi, Mesio-lingual inclined plane of lingual cusp; MBILi, Mesio-buccal inclined plane of lingual cusp; MMR, Mesial marginal ridge; MG, Mesial groove; MBTG, Mesio-bucco-triangular groove; MLiIB, Mesio-lingual inclined plane of buccal cusp; BTR, Bucco-triangular ridge; MBOMR, Mesio-bucco-occlusal marginal ridge; BC, Buccal cusp; MBIB, Mesio-buccal inclined plane of buccal cusp; BR, Buccal ridge; DBIB, Disto-buccal inclined plane of buccal cusp.

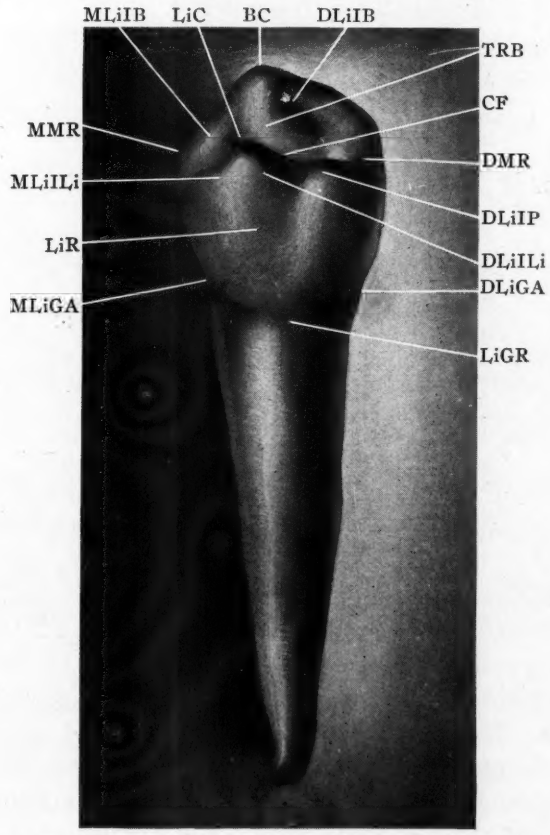


Fig. 28.—Lingual surface of the mandibular right first premolar. MMR, Mesial marginal ridge; MLiILi, Mesio-lingual inclined plane of the lingual cusp; LiR, Lingual ridge; MLiGA, Mesio-linguo-gingival angle; LiGR, Linguo-gingival ridge; DLiGA, Disto-linguo-gingival angle; DLiILi, Disto-lingual inclined plane of lingual cusp; DLiIP, Disto-lingual inclined plane; DMR, Distal marginal ridge; CF, Central fossa; TRB, Triangular ridge of buccal cusp; DLiIB, Disto-lingual inclined plane of buccal cusp; BC, Buccal cusp; LiC, Lingual cusp; MLiIB, Mesio-lingual inclined plane of buccal cusp.

labio- and linguo-gingival marginal ridges are well developed, which can be observed from Figs. 22, 23, and 24. Fig. 24 shows the occlusal view of the tooth. It will be seen that the cusp of the tooth is much nearer the labial surface of the mandibular canine than it is the maxillary canine, and that the lingual border presents a greater slope than the maxillary canine. The extreme slope of the lingual border of the mandibular canine is to allow the food to slide past the lingual border and beyond the gingival gum tissue.

In considering the form of the premolars, we find that they are teeth which have been shaped for mastication; nature having provided them with a wide

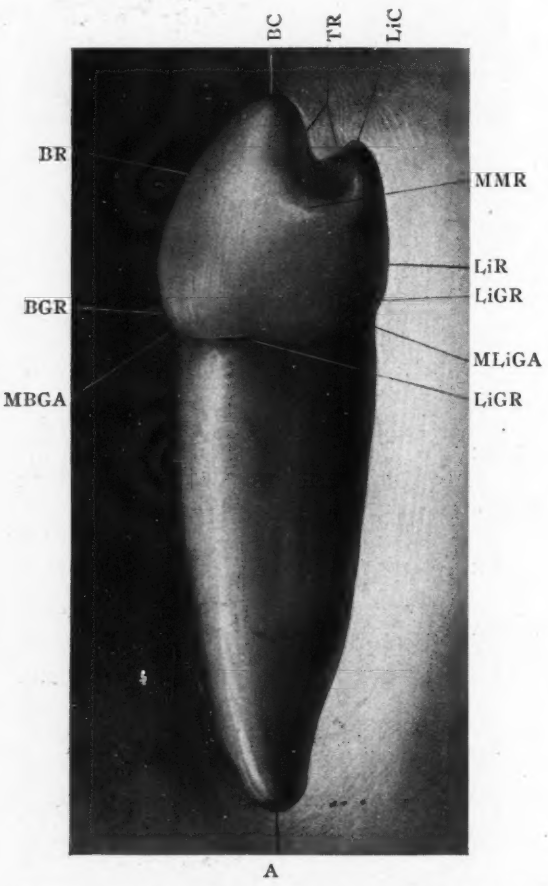


Fig. 29.—Mesial surface of the mandibular right first premolar. BR, Buccal ridge; BGR, Bucco-gingival ridge; MBGA, Mesio-bucco-gingival angle; A, Apex of root; LiGR, Linguo-gingival ridge; MLiGA, Mesio-linguo-gingival angle; LiGR, Linguo-gingival ridge; LiR, Lingual ridge; MMR, Mesial marginal ridge; LiC, Lingual cusp; TR, Triangular ridges; BC, Buccal cusp.

occlusal surface which has not been present in the other teeth considered. As a result of this, one of the most important functions of the tooth form of the premolars is that of mastication, and consequently the occlusal surface should receive much more attention than it has in times past. The mesial and distal proximal contacts of the maxillary first premolar can be accurately seen in Fig. 25, and it will be observed that the contact points are near the occlusal border or near the mesio- and disto-occlusal marginal ridge. It will also be observed by studying Fig. 26 that the buccal cusp appears to be longer than the

lingual cusp, which is true in looking at a tooth from the direct perpendicular axis. However, as the tooth sets in the mouth, the lingual cusp occupies a lower occlusal position than does the buccal cusp; in fact, the lingual cusp is the masticating cusp, having occlusion on four surfaces, while the buccal cusp has occlusion only on the two lingual surfaces. It must be remembered that in the mouth the premolars do not set in a perpendicular position, as they do in this cut, but the crown occupies a much more buccal position than the apex of the root. It will be observed that the gingival marginal ridges of the buccal and lingual surfaces are well developed and that the widest portion of the crown bucco-lingually is to the region of the gingival ridges of the buccal and lingual surfaces. The occlusal surface of the tooth bucco-lingually is much narrower than the gingival portion of the tooth bucco-lingually, resulting in a decided occlusal constriction as compared with the diameter of the crown at the gingival border. This is just exactly the reverse as is found in studying

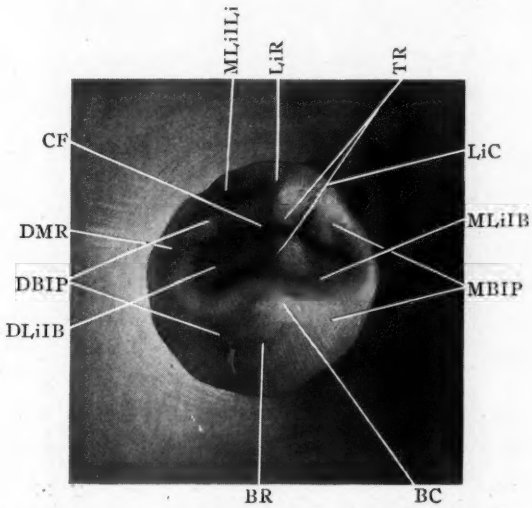


Fig. 30.—Occlusal surface of the mandibular right first premolar. CF, Central fossa; DMR, Distal marginal ridge; DBIP, Disto-buccal inclined planes of buccal and lingual cusps; DLiIB, Disto-lingual inclined plane of buccal cusp; BR, Buccal ridge; BC, Buccal cusp; MBIP, Mesio-buccal inclined planes of buccal and lingual cusps; MLiIB, Mesio-lingual inclined plane of buccal cusp; LiC, Lingual cusp; TR, Triangular ridges; LiR, Lingual ridge; MLiILi, Mesio-lingual inclined plane of lingual cusp.

the mesio-distal diameter of the premolar, because in Fig. 25 you will see the occlusal diameter is much greater than the gingival diameter. This difference in the diameters of the occlusal and gingival portions of the tooth viewed in the two directions, as regards the function, has not been sufficiently appreciated.

Fig. 27 shows the occlusal view of maxillary first premolar which also shows the different diameters mesio-distally and bucco-lingually. It will be observed that the marginal ridges of the buccal and lingual surfaces pass over the buccal and lingual cusps; consequently, if the tooth were measured in that diameter it would be much smaller than if measured through the bucco-linguo-gingival marginal ridge. The mesio- and disto-occlusal marginal ridge occupy positions near the extreme borders of the tooth, and also owing to the development of the proximal contact points the mesial and distal marginal ridges are much farther apart mesio-distally than the mesio- and disto-gingival ridges. As a result of this difference in diameter of the crown the mesial and distal

proximal contact of the premolars are so formed as to make a well-developed interproximal space which is filled with proximal gum tissue. It will also be observed that the triangular ridges of the buccal and lingual cusps slope gingivally towards the central fossa, and running out from the central fossa are the triangular grooves and the mesial and distal marginal grooves which have the function of deflecting the food away from the center of the tooth over the occlusal marginal ridges and into the oral cavity. It will be observed that the mesial and distal grooves extending from the central fossa run towards the lingual surface of the tooth in such a manner that the food passes over the occlusal margin of

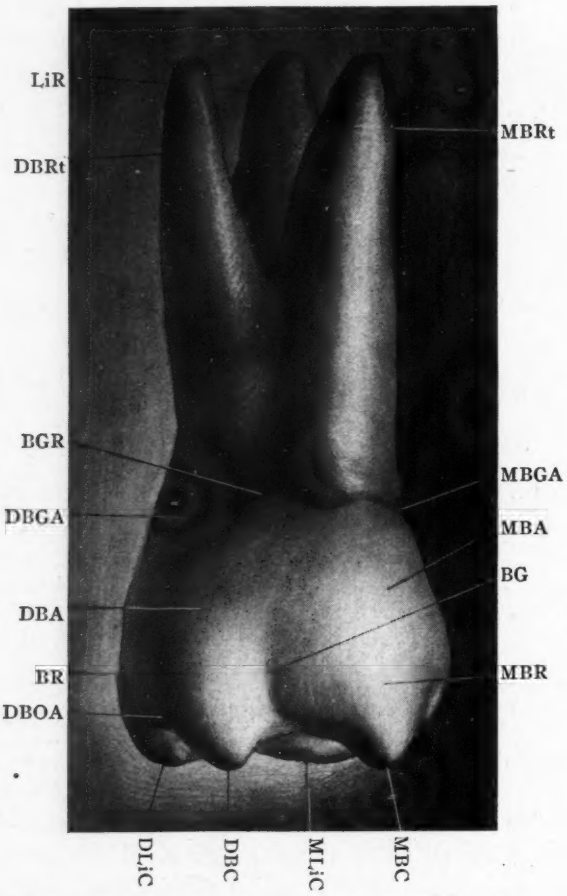


Fig. 31.—Buccal surface of the maxillary right first molar. LiR, Lingual root; DBRt, Disto-buccal root; BGR, Bucco-gingival ridge; DBGA, Disto-bucco-gingival angle; DBA, Disto-buccal angle; BR, Buccal ridge; DBOA, Disto-bucco-occlusal angle; DLiC, Disto-lingual cusp; DBC, Disto-buccal cusp; MLiC, Mesio-lingual cusp; MBC, Mesio-buccal cusp; MBR, Mesio-buccal ridge; BG, Buccal groove; MBA, Mesio-buccal angle; MBGA, Mesio-bucco-gingival angle; MBRt, Mesio-buccal root.

the premolars to the lingual of the proximal contacts and out into the oral cavity and away from the interproximal space. It will also be seen that the form of the occlusal surface of the premolar is marked by three sets of grooves; namely, the central groove, the triangular grooves and the mesio-distal grooves. We also find three ridges running across the occlusal surface of the tooth, which increase the roughness of the occlusal surface and thereby increase the masticating efficiency. Those ridges are the mesial and distal occlusal mar-

ginal ridges and the triangular ridges which form the transverse ridge of the occlusal surface. In speaking of the transverse ridge of the occlusal surface it must be remembered that this is a double ridge formed by the triangular ridges of the buccal and lingual cusps. Owing to the excessive width of the diameter of the tooth bucco-lingually at the gingival border as compared to the same diameter of this tooth at the occlusal border, it will be observed that such food as slides over the buccal and lingual surfaces of the crown of the premolar will be guided away from the gingival tissue owing to the form of the gingival ridge. While the difference in the diameter of the occlusal surface and the gingival margin of the premolar bucco-lingually is apparent to all, this difference in diam-

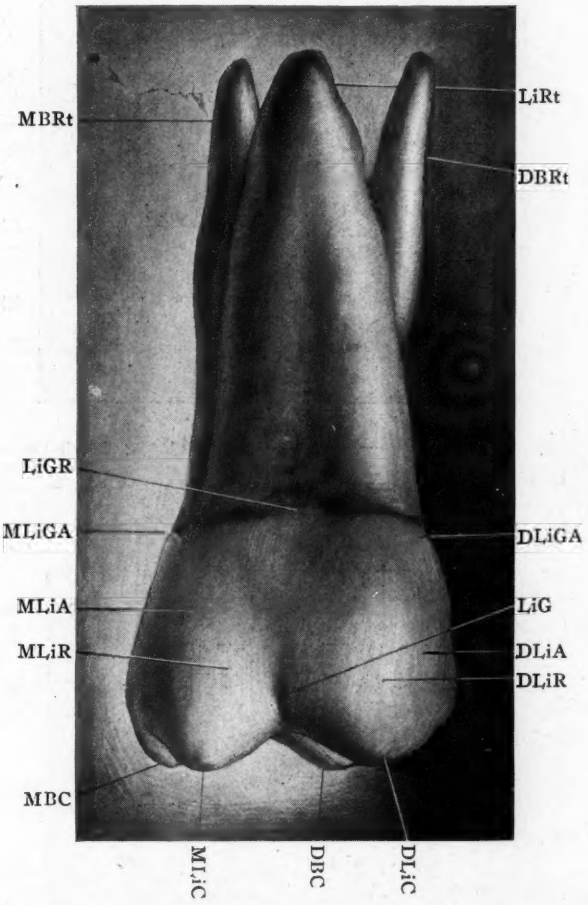


Fig. 32.—Lingual surface of the maxillary right first permanent molar. MBRt, Mesio-buccal root; LiGR, Linguo-gingival ridge; MLiGA, Mesio-linguo-gingival angle; MLiA, Mesio-lingual angle; MLiR, Mesio-lingual ridge; MBC, Mesio-buccal cusp; MLiC, Mesio-lingual cusp; DBC, Disto-buccal cusp; DLiC, Disto-lingual cusp; DLiR, Disto-lingual ridge; DLiA, Disto-lingual angle; LiG, Lingual groove; DLiGA, Disto-linguo-gingival angle; DBRt, Disto-buccal root; LiRt, Lingual root.

eter is not realized by the manufacturers of artificial teeth and is not restored in a large number of restorations made by dentists. I realize that the form of the upper first premolar is very difficult to restore owing to these different diameters at the gingival border and the occlusal border; nevertheless, they must be restored if the tooth is to perform its proper function.

The form of the mandibular first premolar differs very materially from that of the maxillary first premolar, and the function must be carefully con-

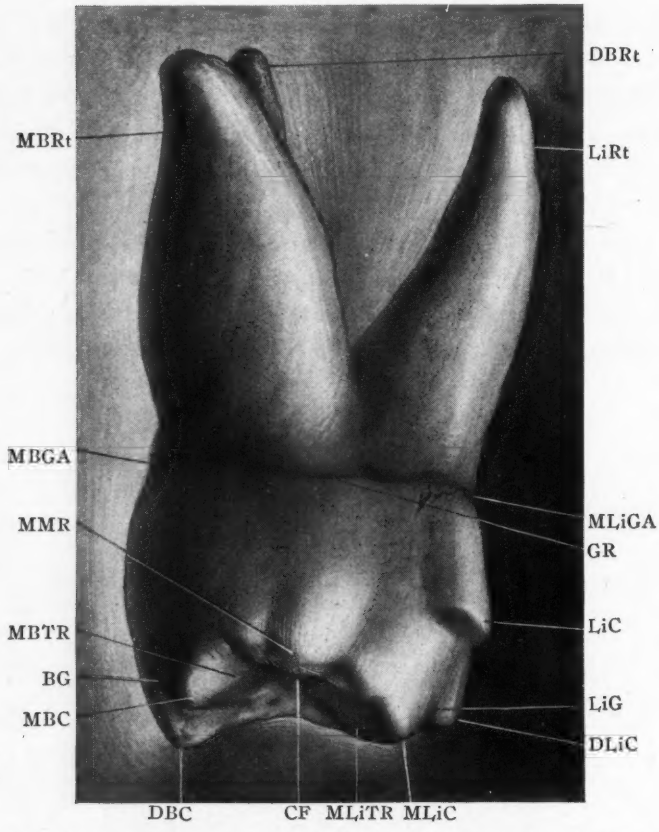


Fig. 33.—Mesial surface of the maxillary right first molar. MBRt, Mesio-buccal root; MBGA, Mesio-bucco-gingival angle; MMR, Mesial marginal ridge; MBTR, Mesio-bucco-triangular ridge; BG, Buccal groove; MBC, Mesio-buccal cusp; DBC, Disto-buccal cusp; CF, Central fossa; MLiTR, Mesio-linguo-triangular ridge; MLiC, Mesio-lingual cusp; DLiC, Disto-lingual cusp; LiG, Lingual groove; LiC, Lingual or fifth cusp; GR, Gingival ridge; MLiGA, Mesio-linguo-gingival angle; LiRt, Lingual root; DBRt, Disto-buccal root.

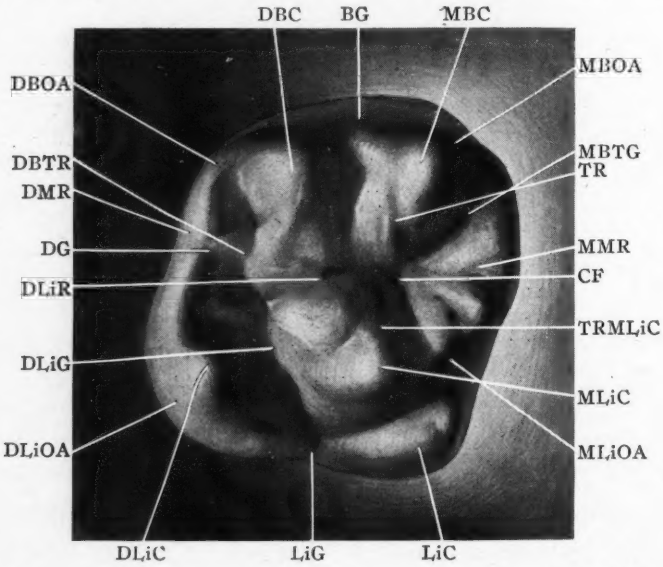


Fig. 34.—Occlusal surface of the maxillary right first molar. DBOA, Disto-bucco-occlusal angle; DBTR, Disto-bucco-triangular ridge; DMR, Distal marginal ridge; DG, Distal groove; DLiR, Disto-lingual ridge; DLiG, Disto-lingual groove; DLiOA, Disto-linguo-occlusal angle; DLiC, Disto-lingual cusp; LiG, Lingual groove; LiC, Lingual or fifth cusp; MLiOA, Mesio-linguo-occlusal angle; MLiC, Mesio-lingual cusp; TRMLiC, Triangular ridge of mesio-lingual cusp; CF, Central fossa; MMR, Mesial marginal ridge; TR, Triangular ridge; MBTG, Mesio-bucco-triangular groove; MBOA, Mesio-bucco-occlusal angle; MBC, Mesio-buccal cusp; BG, Buccal groove; DBC, Disto-buccal cusp.

sidered in relation to that form. It will be remembered that the mandibular first premolar occupies a position in the corner of the mandibular arch at the point of greatest curvature. Fig. 28 shows how the lingual surface of the mandibular first premolar has been shaped to occupy this position in the dental arch, and also shows the extreme development of the buccal cusp as compared to the lingual cusp.

Fig. 29, which shows the mesial surface of the same tooth, gives an idea of the difference in size of the buccal and lingual cusps. It will be observed that the buccal surface of the buccal cusp is a large convex surface with the

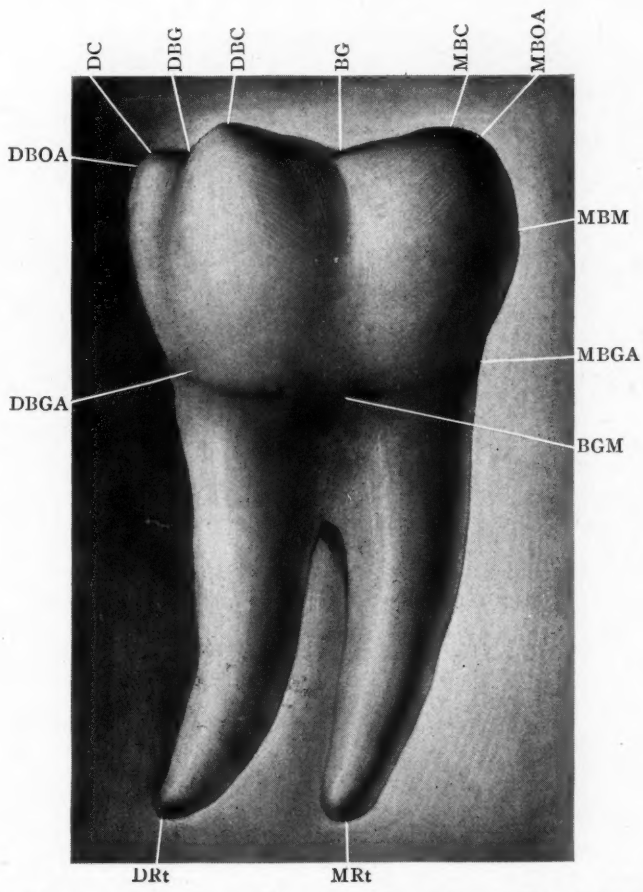


Fig. 35.—Buccal surface of the mandibular right first molar. DBOA, Disto-bucco-occlusal angle; DBGA, Disto-bucco-gingival angle; DRt, Distal root; MRt, Mesial root; BGM, Bucco-gingival margin; MBGA, Mesio-bucco-gingival angle; MBM, Mesio-buccal margin; MBOA, Mesio-bucco-occlusal angle; MBC, Mesio-buccal cusp; BG, Buccal groove; DBC, Disto-buccal cusp; DBG, Disto-buccal groove; DC, Distal cusp.

greatest amount of convexity near the gingival third, forming what is known as the bucco-gingival ridge. It will also be seen that the tip of the buccal cusp of the mandibular first premolar falls near the center of the tooth, and that the buccal cusp makes up about three-fourths of the occlusal surface. The lingual cusp is very small, the lingual surface of which presents very nearly a straight line with some convexity near the gingival border.

Fig. 30 shows the occlusal view of the mandibular first premolar and the long lingual slope of the buccal cusp is such as to slide the food into the oral cavity and past the proximal contact points, thereby avoiding the danger of the food

wedging between the teeth. The position of the central fossa is also important, as it is one of the factors which controls the mastication of the food and assists the mesio- and disto-occlusal marginal ridges to form a mortar in which the lingual cusp of the maxillary premolar crushes the food during mastication.

In passing to the molars we find the form becomes more complicated due to the addition of cusps and the placement of ridges and grooves, which give a greater masticating function than is found in the premolars. Considering the buccal surface of the maxillary first molar, shown in Fig. 31, it will be seen

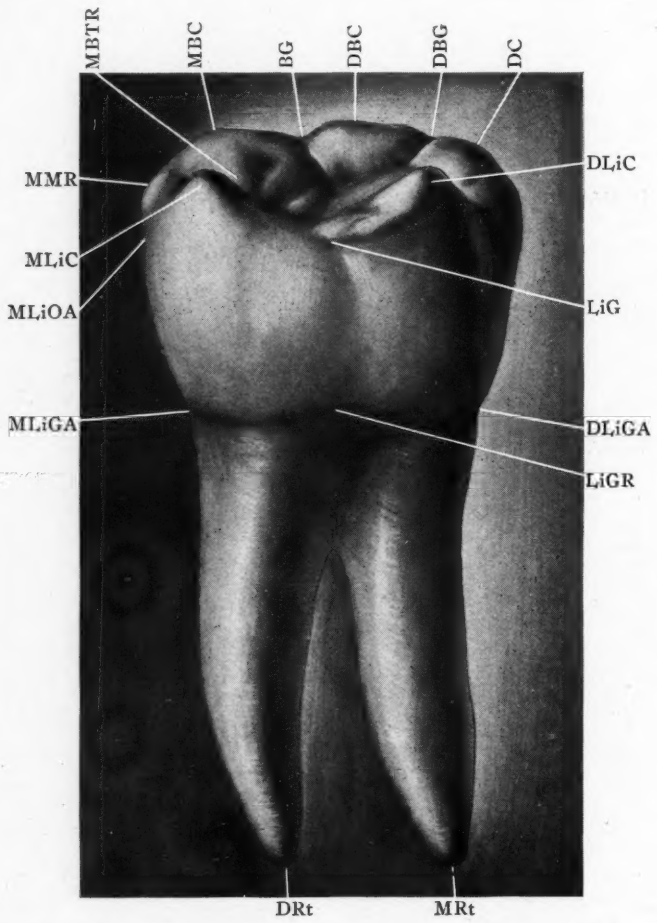


Fig. 36.—Lingual surface of the mandibular right first molar. MMR, Mesial marginal ridge; MLiC, Mesio-lingual cusp; MLiOA, Mesio-linguo-occlusal angle; MLiGA, Mesio-linguo-gingival angle; DRt, Distal root; MRt, Mesial root; LiGR, Linguo-gingival ridge; DLiGA, Disto-linguo-gingival angle; LiG, Lingual groove; DLiC, Disto-lingual cusp; DC, Distal cusp; DBG, Disto-buccal groove; DBC, Disto-buccal cusp; BG, Buccal groove; MBC, Mesio-buccal cusp; MBTR, Mesio-bucco-triangular ridge.

that the crown is a modified cube in which the mesio-buccal angle and disto-lingual angle are acute angles, while the disto-buccal and mesio-lingual angles are obtuse angles. Therefore, in looking at the buccal surface of the crown, it has the appearance of the buccal cusps being placed slightly mesial to the lingual cusps. It will also be observed that the occlusal diameter mesio-distally is greater than the gingival diameter of the crown mesio-distally, which is caused by the development of the proximal contact points and the mesio- and disto-occlusal marginal ridges.

Fig. 32, which is the lingual surface of the maxillary first molar, shows the

same difference in the occlusal and gingival diameters that is observed on the buccal side. It will also be seen that the lingual groove crosses the lingual surface in such a manner as to make the disto-lingual cusp appear the larger, which is not true when viewed from the occlusal surface. The mesio-lingual cusp may not be so long as the buccal cusp, but presents a much greater occlusal surface, and is a more important cusp from the masticating standpoint.

In Fig. 33, which is the mesial surface of the maxillary first molar, we observe the same occlusal constriction bucco-lingually that was observed in the premolar. This results in the buccal and lingual surface of the molar being

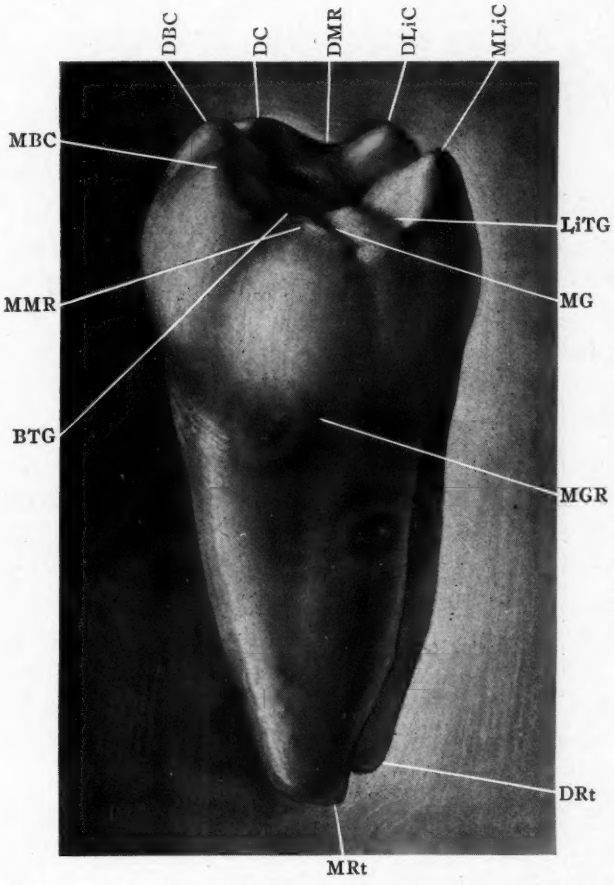


Fig. 37.—Mesial surface of the mandibular right first molar. The tooth is slightly tipped to show occlusal surface. MBC, Mesio-buccal cusp; MMR, Mesial marginal ridge; BTG, Bucco-triangular groove; MRt, Mesial root; DRt, Distal root; MGR, Mesio-gingival ridge; MG, Mesial groove; LiTG, Linguo-triangular groove; MLiC, Mesio-lingual cusp; DLiC, Disto-lingual cusp; DMR, Disto-marginal ridge; DC, Distal cusp; DBC, Disto-buccal cusp.

a convex surface, with the greatest amount of convexity near the gingival third. This development of the gingival marginal ridges is again for the purpose of protecting the soft tissues and must be very carefully restored if the soft tissues are to remain in a healthy condition.

The occlusal surface of the upper first molar, Fig. 34, shows the arrangement of the cusps, ridges, and grooves, all of which have a very important function according to their form. It will be observed that the triangular ridges of the mesio-buccal and disto-buccal cusps slope towards the central fossa and are separated by the buccal grooves which causes the occlusal surface to

have a greater masticating efficiency than if it was simply one ridge. The mesio-buccal triangular groove is so placed that after the food is crushed in the central fossa of the maxillary first molar by the buccal cusps of the mandibular it will be either deflected buccally past the proximal contact point, or lingually into the lingual proximal embrasure by the action of the lingual grooves. Owing to the excessive development of the mesial marginal ridge of the occlusal surface of the upper first molar there is a greater tendency for the food to pass distal to the central fossa then into the disto-lingual groove, which groove runs toward the lingual surface of the tooth and over the lingual marginal ridge into the oral cavity. The disto-occlusal marginal ridge of the upper first molar is also well developed, which again becomes an important factor in preventing the food from crowding or wedging in between the teeth. The long lingual slope of the mesio-buccal and mesio-lingual, and the buccal slope

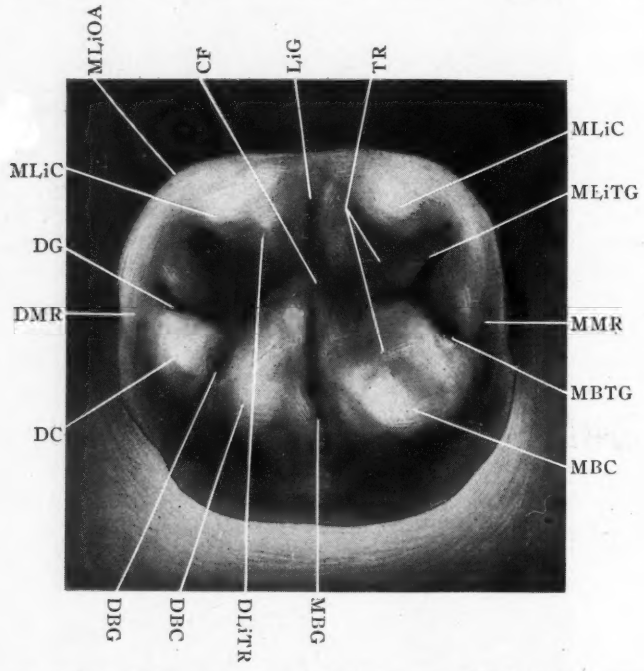


Fig. 38.—Occlusal surface of the mandibular right first molar. MLiC, Mesio-lingual cusp; DG, Distal groove; DMR, Distal marginal ridge; DC, Distal cusp; DBG, Disto-buccal groove; DBC, Disto-buccal cusp; DLiTR, Disto-linguo-triangular ridge; MBG, Mesio-buccal groove; MBC, Mesio-buccal cusp; MBTG, Mesio-bucco-triangular groove; MMR, Mesial margnial ridge; MLiTG, Mesio-linguo-triangular groove; MLiC, Mesio-lingual cusp; TR, Triangular ridges of mesio-buccal and mesio-lingual cusps; LiG, Lingual groove; CF, Central fossa; MLiOA, Mesio-linguo-occlusal angle.

of the disto-lingual cusps of the maxillary first molar are important factors in keeping the food on the occlusal surface of the tooth and, consequently, greatly increasing the masticating efficiency. It will again be observed that the buccal and lingual marginal ridges are placed nearer the center of the tooth than are the mesial and distal marginal ridges. This position of the buccal and lingual marginal ridges assists in forming the convexity of the buccal surfaces. The convexity of the buccal surfaces is such that the food is carried past the margin and that they assist the gingival marginal ridges in protecting the gum tissue. The mesial and distal marginal ridges being placed close to the extreme border of the tooth assist the proximal contact points in keeping the food from wedging in between the teeth, and also assist in causing the food to slide towards the central fossa rather than to slide into the interproximal space.

The buccal surface of the mandibular first molar, Fig. 35, is quite different from the buccal surface of the maxillary first molar. Nevertheless, the majority of artificial teeth that are made and a large number of the crowns that are constructed, have the buccal surfaces of the mandibular and maxillary teeth made in the same manner. It will be observed that the occlusal diameter of the tooth mesio-distally is much greater near the occlusal third than it is at the gingival third. There are also present two buccal grooves; namely, the buccal groove which separates the mesio-buccal and disto-buccal cusps, and the disto-buccal groove which separates the distal cusp from the disto-buccal cusp.

Fig. 36, which shows the lingual view of the mandibular first molar, clearly brings to mind the fact that the distal surface is shorter mesio-distally than the buccal surface due to the fact that it presents only two cusps. Only two cusps being present, there is but one groove on the lingual surface, which is the lingual groove. As a rule, it is deeper than the buccal groove so as to allow the food to slide out of the central fossa lingually into the oral cavity.

Fig. 37, which shows the mesial surface of a mandibular first molar, gives an idea of the comparative width of the gingival diameter of the tooth as compared to the occlusal diameter. It will be seen that the buccal and lingual marginal ridges occupy positions nearer the center of the tooth and that owing to the development of the buccal and linguo-gingival marginal ridges the diameter of the tooth is much greater through the gingival third than it is at the occlusal portion.

Fig. 38 shows the occlusal surface of the mandibular first molar and the arrangement of the ridges and grooves in such a manner as to make mastication most efficient. The well-developed mesio- and disto-occlusal marginal ridges in conjunction with the proximal contact points prevent the food from wedging in between the teeth. It will be observed that the ridges and grooves forming the central fossa are so arranged that there is greater tendency for the food to slide toward the center of the tooth and then out between the mesio-lingual and disto-lingual cusps through the lingual groove into the oral cavity. It will be observed that the triangular ridges of the buccal cusps are very long and, for that reason, are more important masticating surfaces than are the buccal ridges of the lingual cusps. It will be seen by studying the occlusal surface of the mandibular first molar that the buccal cusps occupy about three-fourths of the occlusal area, and, consequently, are the more important cusps from a masticating standpoint. The importance of the mesial and distal marginal ridges can not be overestimated when we consider that they are so placed as to prevent the food from wedging between the teeth and also are so shaped as to cause the food to slide toward the center of the tooth, consequently increasing the masticating efficiency.

As we study these various tooth forms, the buccal, lingual, mesial and distal surfaces of the anterior teeth, as well as the same surfaces of the premolars and molars, we will consider that these forms must have a very important function. When we consider the differences between the occlusal surfaces of the maxillary and mandibular premolars and the occlusal surfaces of the maxillary and mandibular molars, we will readily see that again the form must play a very important part as regards the functions of these teeth.

ORTHODONTIC TREATMENT BY PARCEL POST

By Harry P. Beaser, D.D.S., Fresno, Calif.

THE successful treatment of malocclusion by mail is rather a new departure in orthodontics, but the fact that it is being successfully accomplished is hereby recorded.

There are probably many cases of long distance treatment being carried on

Fig. 1.

Fig. 2.

by men in the general practice of dentistry with varying degrees of unsuccessfulness. But the long distance part of their work is in having their appliances made on a model by some laboratory at some remote point. In these cases the actual treatment will be given first hand according to written instructions from the manager of the laboratory from whence the appliance comes.

What I will attempt to describe is the treatment of a case with the Jackson removable appliances. The patient is a student at a government aviation school several hundred miles away and can not appear in person whenever it might be deemed necessary to have him.

Fig. 1 shows the models of the case as it presented July, 1915. Fig. 2 shows

the result after eleven months of treatment by the use of the ordinary threaded alignment wire.

At this time the patient moved away and an active retainer was placed on his teeth and instructions were given to call upon an orthodontist in the city to which he moved. Subsequent events proved, however, that this had not been done, and the retainer which became loose at some point was taken off and thrown away some weeks later.

During the summer of 1917 the young man obtained a leave of absence from the aviation school and presented himself again for treatment. Fig. 3 shows the models of the case as it then stood; but, although the appearance and occlusion were both greatly improved, a comparison between Figs. 2 and 3 will show that the teeth had drifted considerably and a more perfect alignment was desired.

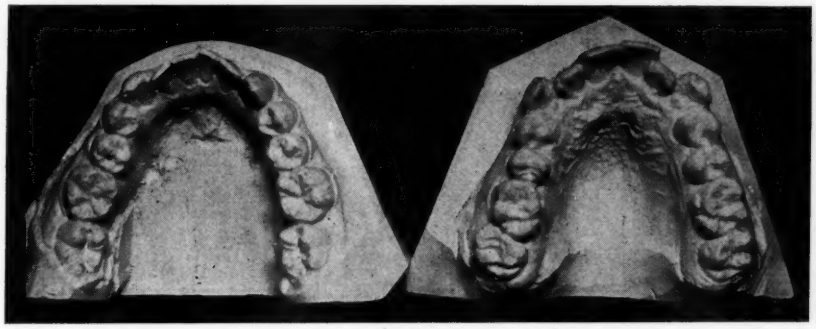


Fig. 3.

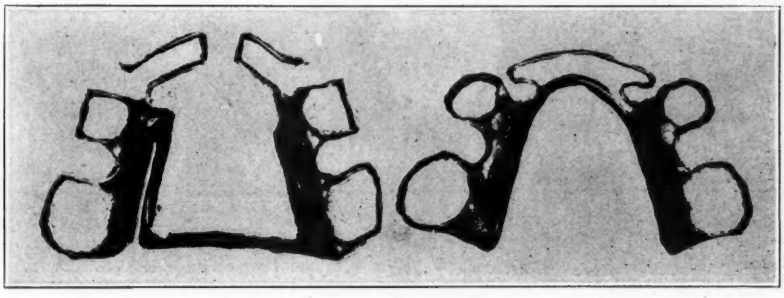


Fig. 4.

As the patient was quite reliable, I decided to use the removable appliances for treatment. Fig. 4 shows the upper and lower appliances which were immediately constructed and placed in the mouth. After a few adjustments were made and the appliances were perfectly comfortable, instructions were given the patient as to the method of taking them out and putting them in and the necessary prophylactic attentions. On the day before his return to the training camp, tension was placed in the finger springs and a slight amount of expansion given in the region of the bicuspids and a diagram made (Fig. 5) for the purpose of measuring the movement after each adjustment.

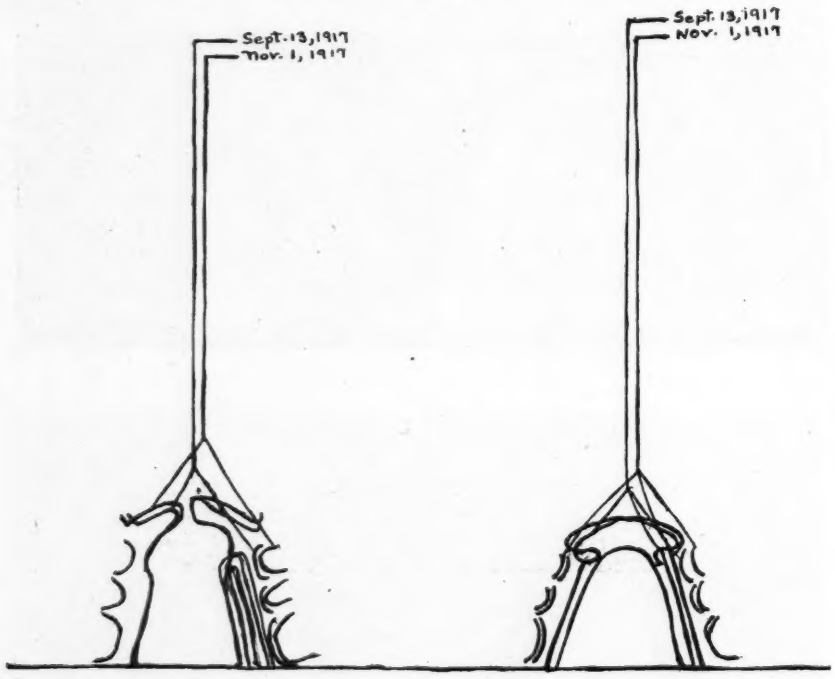
Instructions were given to return the appliance by mail every two weeks,

at which times, comparisons were made with the first diagram and the models, and new adjustments made calculated to give the necessary pressure for the next two weeks.

The diagram (Fig. 5) is marked at longer intervals than every two weeks as the lines would be so close together that they would blur. So whenever a sufficient movement is shown a new marking is made.

At intervals of about two months a piece of modeling compound is sent to the patient and a bite-impression is made. The patient does this for himself and after a few trials very creditable impressions were taken, sufficiently accurate to

Name.—Edward C. Waterman.
Address.—Aviation Training Camp, San Diego, Calif.
Parents or Guardian.—Mr. E. B. Waterman, Tulane and L Sts., Fresno, Cal.
Age.—16½. Diagnosis.—Neutro-Occ.



Examination.—July 24, 1915.
First Impressions.—July 24, 1915.
Second " —June, 1916.
Third " —Sept. 7, 1917.
Fourth " —.....
Last " —.....

Retaining Appliances.—.....
Completion of Case.—.....
Model No's.—.....
Photographs.—.....
X-Ray.—.....

Fig. 5.

make study models. These are of great assistance in following the course of work. Although it is orthodontic treatment under difficulties, the progress made is very gratifying. As the case is still under treatment finished models can not be shown, but, if it all goes as well as it has progressed thus far, the finished result will be very pleasing and satisfactory.

It would not be advisable to use this long distance treatment promiscuously, but by the proper selection of cases and thorough cooperation on the part of the patient very excellent results can be obtained.

THE POSSIBILITIES OF THE LINGUAL AND LABIAL ARCH —SINGLE OR IN COMBINATION

By A. C. Gifford, D.D.S., Oshkosh, Wis.

ALTHOUGH many articles have been contributed of late upon the use of this form of appliance, much more may be written, for we have in this, one of the most delicate, cleanly, and inconspicuous contrivances ever applied for orthodontic purposes. The marvelous things which may be accomplished by one who is proficient in the technic governing the application of one or both of these devices, seems almost beyond imagination, for there are no ligatures to impinge upon and irritate the soft tissues, and absolutely no appliance visible upon the labial surfaces of the teeth.

Lourie, of Chicago, recommends the solid or soldered attachment of the lingual arch, while Mershon, of Philadelphia, recommends the removable arch. These require an altogether different technic and as I have used but the soldered nonremovable one, I prefer it. As the adjusting or stretching of the wire must be done with care and exactness, I agree with Lourie when he recommends that until one has become experienced, the removable arch should be used, so that if necessary, it can be removed and adjusted, thus avoiding future complications. Until one has mastered the technic governing the adjustment of the wire, much harm may be done, as the pressure once applied, can not be relieved; the same being positive and movement of some sort must follow. The appliance, therefore, is treacherous, unless thoroughly understood. I consider that I have at times moved teeth more rapidly than was desirable, but even at that, there is never the alarming soreness which sometimes results from the use of ligatures.

To give you some idea of the "stretch" of a nineteen gauge, fifteen per cent iridio-platinum wire or a platinum-gold wire, it has been found that one can increase the length of such a wire, ¼ to 5/10 or 6/10 of its length before its usefulness is exhausted. This will very often cause sufficient tooth movement; but, in case it does not, it is no hard matter to attach a new lingual arch to the bands which are already upon the anchor teeth. There are great possibilities in this combination of the labial and lingual arch, and I believe that by slight additions, any movement can be accomplished that has been possible heretofore by the use of those more conspicuous and uncleanly appliances.

Before giving you anything upon the mechanical construction of this form of lingual arch, I wish to impress upon you that this apparatus is one, which not only successfully moves the teeth, but retains them as well, for what more efficient retainer could be made than the appliance which guides the teeth into their normal position? The lingual arch or combination of lingual and labial, is, therefore, an orthodontic appliance and a retainer combined.

Before constructing the apparatus, in order that it may accomplish all the tooth movement necessary in a given case, great care must be taken to ascertain just how much movement is necessary and where anchorage is to be applied. As the patients are of all ages, it becomes quite essential that our ap-

pliance does not reach beyond the necessary area and yet includes all of that portion requiring tooth movement.

My method of working is as follows: Having decided upon the anchor teeth and fitted the bands, I take an accurate modeling-compound impression with the bands on the teeth, and from this model, again make note of all the teeth which will require movement. In order to have the pressure greatest against those requiring the most movement, I scrape away a slight portion of those teeth in order that the wire may fit more closely, and adapt the wire as accurately as possible so that it will rest against the teeth that are to be moved.

Fig. 1.

I fasten the wire in place with pins and then go over it with the burner, heating it to a cherry red, which leaves it in a perfectly neutral condition. This can be accomplished in no other way. I use the high-fusing platinum-gold wire put out by Thomas J. Dee, which I find works very satisfactorily in my hands. I believe that when the appliance is first put in place in the mouth, it should be worn at least a week before pressure is applied.

When the time comes to put the labial arch in place, it will be found best to remove the lingual arch and bands from the mouth and to fit the entire appliance upon a model, for it is rather difficult to successfully construct a labial arch with the anchor bands on the teeth and in the mouth. The "spring" must also be taken out of the labial arch, sometimes called "body wire," by the application of heat; and it is best that this be done with the arch in place in the tubes. It is always safe to put tubes, either half-round or square, on the buccal side of the anchor bands, especially when attached to molars, and these may be

placed either mesio-distally or gingivo-occlusally. Personally, I prefer the gingivo-occlusal position, for it seems to hold the labial arch, or body wire, more rigid, and when locked in is also most desirable as it gives more stability to the anchorage and produces body movement of the anchor teeth. The labial arch, if perfectly fitted, is of no inconvenience and with the very small "finger springs" attached it is safer in the mouth than anywhere else. It is very inconspicuous and I have patients who say they would be willing to wear it the remainder of their lives if necessary. The lock should be so constructed that should any accident befall the labial arch or its "finger springs," it could be removed by the patient himself or some member of his family.

As to the "finger springs," their position depends upon the result one wishes to accomplish. There are a great many positions that they may occupy, and so many different movements possible by their use that one must govern himself accordingly. For example, take the case shown in Fig. 1 now under

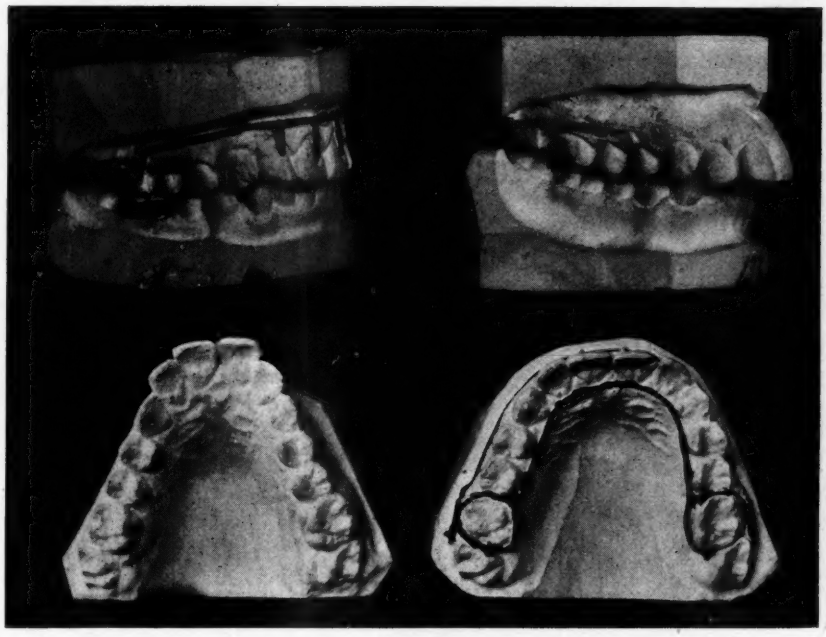


Fig. 2.

treatment, in which no other appliance has been used. After the upper lingual arch had been in place about seven months, and enough expansion had taken place to make room for the canines, I removed the appliance and attached 22-gauge "finger springs" to the molar bands in such a position that when neutral, they would be about where I considered the canines should be. I rested the "finger springs" upon the canines and the illustration shows what the result has been. Can you think of any appliance that would accomplish as much with as little visible upon the teeth?

Fig. 2 illustrates one of those cases, which required the addition of intermaxillary elastics when the usual form of appliance was used. I used the lingual and labial arch in combination. I say "in combination," but the lingual arch was in place for four months, widening the arch laterally, before the labial arch was applied. Another four months and a half have elapsed since then, and in view of the corrected condition, one can hardly fail to see the advantage

in the use of an appliance of this sort, especially when one remembers that it is the only retainer required when the correction is completed. However, one must use it to fully appreciate its fine points, its absolute cleanliness, and the perfectly healthful condition of the mucous membrane surrounding the gingiva.

In the construction of the appliance for use in cases similar to the one illustrated, one must remember that the lingual arch must rest only upon the premolars and distal portion of the canines, for at this point the expansion is to take place. Take into consideration also, the distal movement of the centrals and laterals, and see that enough space is provided to accommodate these changes. When the lingual arch is in place, the patient may have a slight disposition to lisp, but this soon passes away except in the case of a self-conscious person.

Now take the case of a lingually impacted canine: If the tissues are opened, and a pin cemented in the lingual portion of the impacted tooth, a lingual wire may be fitted and a "finger spring" attached as in Fig. 3. In this way the impacted tooth can be moved into line in a relatively short time.

When distoclusion is present, it is rather necessary that a band be cemented onto the first premolar with a loop resting over the lingual wire, for this will act

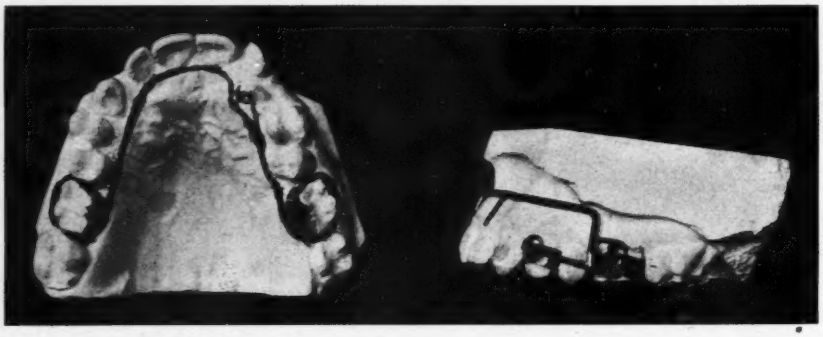


Fig. 3. Fig. 4.

as a preventive against the tipping of the anchor teeth. If the labial arch is also to be used, it is not a good policy to attach the intermaxillary hook to it, because the labial arch is placed so high, it will have a tendency to pull downward and to press the "finger springs" upon the anterior teeth more than is necessary. Conservatively applied, however, it is that pressure which comes from labial arch or body wire with its "finger springs" that is the most effective. The intermaxillary hook should not be fastened to the band upon the premolars as that will produce a loosening of the tooth and movement which is not desirable. I have experimented with various forms of attachment for the intermaxillary elastics, but the most satisfactory is that shown in Fig. 4. In case no labial arch is necessary, the wire may be soldered directly to the band. The lower attachment is, of course, a hook upon the mesio-buccal portion of the molar.

In the case of youthful patients, when the temporary canines are in place, one is often able to place the anchor bands upon them with a spur, soldered to the disto-lingual portion, extending back to include the first temporary molar and occasionally the second, and get all the expansion necessary for the erupting incisors.

ENDOCRINODONTIA, OR THE DUCTLESS GLANDS—THEIR EXPRESSION IN THE HUMAN MOUTH

By Herman E. S. Chayes, D.D.S., New York City

PART II

DR. D. M. KAPLAN, the director of the laboratories at the Neurological Institute of New York, published an article in *Endocrinology* of April, 1917. He called this article "An Endocrine Interpretation of the Dental Apparatus."

The quotation of this article in full will be illuminating, particularly since I wish to point out what appear to me to be some slight errors in his conception and nomenclature.

"There is not the least doubt that the glands producing internal secretions exert an influence upon the exterior of the individual. Although the uninitiated still may consider certain individual peculiarities as accidental, the endocrinologist knows which organ, or organs, were instrumental in the production of these seemingly accidental phenomena. To ascribe a certain bodily appearance to accident is a confession of ignorance, which, however, is becoming less frequent the more one studies the mystic forces of the endocrines. The study of their functions can not be severed from the study of these glands, so much so, that one may justly call this specialty an investigation of the 'compensatory dynamics of the endocrines in health and disease.'

"To understand the compensatory workings of the endocrines is to know 'internal secretions;' and to be able to translate it into terms of physiology and pathology is to know how to handle your patient from an endocrine point of view. There are many external manifestations resulting from the work of the endocrines that have been carefully studied, many that are only superficially known, and still more to be discovered in the future. To the endocrinologist a pigmented mole is not an accident, nor the mustached female of twenty-five, nor the soft pulse at eighty, nor the high blood pressure at thirty, nor the enlarged, noninfected tonsil. It is the why and wherefore of a peculiarity that is the constant question before the endocrinologist, and very often the answer is radically opposed to orthodox allopathic thought. Therefore the uninitiated may be perplexed by the stand taken by the student of compensatory dynamics, who argues against the reduction of a high blood pressure in a certain patient, or the removal of the tonsils in another, and yet he may offer very sound reasons for both conclusions.

"In his endeavor to arrive at the truth, the student of 'compensatory dynamics' takes into consideration the fact that certain infections have an affinity or, as I have designated it, a 'tropism' for certain glands with internal secretion. For instance, it is known to all that mumps is an infectious disease that often attacks the gonads. It has been noted that diphtheria and

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typhoid have a tendency to cripple the adrenals, so that mumps is known as a gonadotropic infectious disease, while diphtheria is an adrenotropic.

"There is also a definite tropism between endocrine disturbances and the dental apparatus. Ewan Waller, of Birmingham, England, has very definitely associated the teeth in children with the thyroid function. It seems that the glands with internal secretions play an important role not only in the structural, but also in the physiochemical economy of the individual. A great number of the unclassified subjective disturbances formerly designated as neurasthenia, neurosis, or hysteria, and lately as vagotonia, can be more justly ascribed to an aberration or a disturbance in the compensatory dynamics of the endocrines. The thorough investigator of the constitution of an individual in health or disease takes into account the phenomena not only as pictured in our books on diagnosis, but also the time of day or night, the amelioration or intensification of symptoms in the evening, its involvement of the right or left side of the body and he differentiates where the same complaint appears in the juvenile, adult, or senile individual.

"There are a great many points dismissed by the uninitiated as insignificant, which the endocrinologist employs to advantage in building up a picture of disturbed equilibrium in a patient. The peculiarities of the dental apparatus is one of them.

"*Thyrodontia.*—It is a fairly well-established fact that the calcium metabolism is governed chiefly by the thyroid apparatus, and secondarily, by the rest of the endocrines. The alkalinity of the saliva to a certain extent depends upon calcium salts. It is to be seen how a disturbed endocrine equilibrium could bring about dental decay by a disturbance in the calcium metabolism balance, particularly in children who depend upon their thyroid and thymus more than the adult and senile. The calcium being deficient, the acids from food decomposition are not neutralized, and the dentine consequently suffers, this being one of the stages in the complete breaking down of the tooth. In children particularly, a well-balanced thyroid and sound teeth go together. If the thyroid is not performing its duties properly, the tooth to suffer first is the molar. The submaxillary saliva is said to be richer in calcium than the parotid, and in view of the fact that the molars lie behind the duct, their supply of immunizing saliva is less than the front teeth, and hence, in case of calcium deficiency, they succumb first. This is manifestly apparent in the longer life of the lower front teeth as compared with the upper, the latter not having the constant salivary bath enjoyed by the lower teeth. This is very characteristically displayed by the woman with an exhausted thyroid, due to repeated pregnancies, who invariably loses her upper incisors. Of course in such women the other endocrines enter into the mechanism conducive to dental loss.

"To start with, thyroid teeth are distinguished by their slender frame, they are thinner, more transparent, and graceful, and their color tends toward a bluish gray white. Children and married women with such teeth can be saved a great deal of dental trouble by the discreet and timely administration of thyroid extract. The frequency of the therapeutic display depends entirely upon the case and the acumen of the physician.

"In the multipara the dental situation from an endocrine point of view

is only partly thyroidal. The interplay and compensatory work of all of them are necessary to help her through this physiologic symbiosis. If the woman is deficient in any of the endocrines, she will display not only dental changes, but all kinds of other objective and subjective manifestations depending upon the glands or gland involved. The falling out of the upper incisors independent of decay, bears a distinct pituitary stamp and one may say that the maxillary sockets become too large in some pregnant women, and that the root is not firmly implanted in such a jaw, at this episode of partial transient physiologic acromegaly. It is the duty of the discerning physician, as well as the dentist, to guard against irreparable loss, disfigurement and suffering of patients by a timely use of thyroid extract in cases of dental caries or late eruption, as well as in gestations that promise injury to the teeth.

"*Pituitodontia.*—Many individuals who are free from complaints that would compel them to seek a physician's advice, are the possessors of teeth characteristic of the acromegalic. The owners of such teeth need not develop acromegaly, nevertheless they must be regarded as potentially pituitary. Chronic frontal headaches and the slightest limitation in the temporal visual fields, require very earnest attention and extremely judicious endocrine therapy, for at such a stage one might hold out some hope of deferring the advent of the full-fledged acromegalic picture. Increase in size of the acral parts is the chief objective sign of this disease and the pituitary is the gland responsible for its appearance.

"It must not be forgotten, however, that not only an increase, but also a very marked diminution in size, belong to the activity of the pituitary gland; so that giant and pigmy are endocrinologically related. The same applies to the teeth. The average pituitary dental arrangement shows large square teeth; oftener than not the upper middle incisors are spaced (trema) and the rest of the teeth may share in their separation, stopping at the bicuspids. On the other hand, marked overcrowding is a feature which also belongs to the department of hypophyseal activity, so that one is frequently confronted with a situation requiring great care in endocrine interpretation. The gestating female has been referred to before, but it must be reiterated, that the falling out of the incisors, particularly the lateral one, has a double meaning. At present let us not forget that the middle upper incisors are preeminently the teeth closely associated with direct primary pituitary function. This does not signify that the individual has a pituitary abnormality incompatible with perfect health; it may show itself in anybody with accepted hypophysial markings, such as being very tall or very short, having a very large head, particularly in the frontal part, or manifesting a tendency to adiposity in the young or adult, with or without hypogenitalism. It may accompany the feminine type of man who shows his abnormality in his teeth only, and his sexual anomaly in his psychoanalysis.

"*Gonadodontia.*—Individuals with a gonadotropism may give in their history an attack of mumps during childhood. Close relationship between this contagious disease and the genital glands is established by the frequent involvement of the ovary or testis in a complicating inflammatory reaction. It is not necessary that the individual previously having had mumps should present earmarks of a definite gonad disease, he may yet show them in the future or not

at all. This depends entirely upon the compensatory work of the rest of the endocrines.

"In all endocrine manifestations not only the soma, but also the psyche is influenced. Besides these psychic attributes most of them show definite somatic stigmata, of course not all of them, the exceptions here as elsewhere serving to establish the rule.

"In the gonadotropic individual the dental apparatus carries a very striking earmark of the tropism. If the middle upper incisors carry a message from the pituitary, the lateral upper incisors certainly do the same from the gonads. So that when the gonads are teratologically *ab ovo* definitely abnormal, one is sure to find some abnormality in the upper lateral incisors. The relationship, if any, is a crossed one, so that the right upper lateral incisor may point to the left testis or ovary, and vice versa.

"It is also to be noted that the greater the deviations from normal, the more definite the markings in the dental department, so much so, that the lateral incisors, as a result of a marked gonad defect, may not have erupted at all. Such a dental situation is rare indeed, so is also the clinical condition presented by the patient who has it. Here is a situation that the gynecologist could profit by, and the surgeon add another sign to the significance of right-sided abdominal pain. Such a pain is usually ovarian, when the left upper lateral incisor is faultily implanted, showing the mesial edge of the tooth anteriorly, and protruding in front of the middle incisor. The teeth presumed to be connected with the gonads (upper lateral incisors) carry the stamp of ovarian or testicular abnormality in their size, shape or implantation.

"The ovary should always be suspected where pelvic pain is manifested in a patient whose lateral incisors are abnormal. In the male, small stumpy laterals bespeak sexual impotence on a physical basis, many gonorrheas, prostatic insufficiency, and chronic strictures. In such an individual one may obtain the history of mumps, and if he had a rightsided orchitis or epididymitis, more often than not his left upper lateral incisor will be differing from the normal, taking his entire dental apparatus on the standard of comparison.

"On rare occasions the compensatory work of the other endocrines is so well adjusted that the dental anomaly is obliterated, and gives no clue to the existing gonadopathy. There are, however, other external signs from an endocrine point of view that would direct attention to the existing state of affairs. As the dental apparatus is the subject of this paper, the other signs will not be discussed.

"There is a dangerous tendency among endocrinologists to designate with peremptory precision that this or that organ is involved, and is responsible for the endocrine picture. Very often the external manifestations are caused by another gland whose functions it may be to bring about phenomena on the surface of the patient, such as, for instance, the adrenal system; and some students may be carried away by this easily demonstrable, superficial appearance, and be led to assign to the objective findings the place of first importance; whereas, the adrenals have simply acted in response to a call from some other gland. The gonads always require adrenal help in performing their work, and when they do not come up to the physiologic requirement, be this in the

form of under- or overactivity, the adrenals are then called upon for additional assistance, resulting, secondarily only, in manifestations appearing on the skin, mucous membranes, hair, etc. The primary, *ab ovo,* situation can be read from the teeth and the gland responsible for the trouble more often than not, can be unerringly named and proper therapy suggested. It is remarkable how readily the patient responds when the proper drug is prescribed, but here, as elsewhere, the futility of attempting replacement therapy in some cases must be thoroughly gauged.

"A young woman suffering from the torture resulting from a complete oophorectomy can not be benefited much by ovarian extracts, be it the whole gland or the luteal portion. In some cases one must be able to read intelligently the symptomatology, and curb as much as possible the pituitary compensation, for in such cases, this is the gland that may be causing much of the subjective discomfort. If the pituitary, however, is not capable of compensation, or is only partly able to assist, the adrenal and thyroid systems are employed to overcome the deficiency. Depending upon the fitness of these glands one will have a predominating adrenal or thyroid symptomatology. Therapeutic success depends entirely upon our ability to recognize the vicarious execution of functions by glands with a different purpose.

"*Adrenodontia.*—It is to be conceded that the ability to perform better work requires better tools. In biology this is everywhere evident. From times immemorial the longer and sharper tooth was part of the outfit of the pithecanthropus, whose survival was assured. Such a specimen was perhaps also the hairiest of the tribe. As time advanced and the necessity for using the teeth in offensive and defensive existence became secondary to the special development of the thumb and hands, the chief fighting teeth, the canines, became shorter, and in some very peaceful members of our semisimian ancestors, also less sharp. With the greater use of the hand came the perfection of that part of the brain that serves as the storehouse for memories. These memories became the heritage of the future man, and with the greater specialization of the hand, the teeth were gradually discarded as weapons of defense and offense. The emotions in the state of offensive rage still cause the display of them, although one does not use them.

"Vasomotor force and the tone of muscles depends upon the proper work of the adrenals. Only when these glands work better than the others, it is possible to think of the enduring prizefighters. When the pituitary is equally well adjusted, one has the heavyweight champion type. But the ability to scrap, whether curbed by education or environment, or not, is indelibly marked in the canines. As one of our ancestors would have learned by experience that his short and blunt canine was no great weapon in a fight and would have become the champion of peace instead of conflict, so also the present man prefers discretion to valor because of his inadequate adrenal endowment or, as one may term it, lack of biologic equipment for strife. Whether man or woman, both show in a long sharp canine an atavistic remnant of a bellicose progenitor, and upon proper provocation justify the above contention.

"Very often the large and sharp canine in a woman bespeaks the aggressive agitator, public speaker, or militant suffragette. Some of these women studied

from the point of view of biologic balance possess other endocrine markings, showing that they are not women to the full extent that nature intended the average woman to be. The woman whose skin is rough, who finds pleasure in curbing wild horses, who cares not for the duties of home life, and who is an expert administrator (purposely using the masculine) must give up a certain amount of natural feminism in order to be able to enjoy and accomplish the above things. Very often with such traits goes a masculine hand, a mustached lip, a large-pointed canine, and a deficient gonadodont. The sexual psychopath could be detected by a study of his dental apparatus, and the endocrine therapist might supply the glandular extract that would give a more natural trend to the twisted psyche of the possessor.

"The spinster who truly rejoices in her single blessedness does not do so from choice, but rather from her innate promptings. Being less of a woman than her well-balanced sister, she does not require the society of a man, and frequently shows her genuine distaste for such company by an appropriate remark. In her pursuits she wants to dominate and frequently fills with credit a position requiring great virility. She abhors the evening gown, and wears clothes of a masculine type, low heels, no corsets, side pockets, collar, and tie.

"The male counterpart with short, stumpy and dull canines gives up some of his primordial male aggressiveness, and becomes the Jacob instead of the hairy Esau. The kitchen is his place, he can sing in high notes, never a basso, and has the greatest inward storms when the time comes for him to propose marriage to his heart's choice. Such a man stands a poor chance of being accepted by a girl well balanced from an endocrine standpoint. It is the one who will not enlist to help defend his country, but will offer a thousand and one reasons why he should not fight, that war is a reversion to barbaric times, etc. Such men are afraid that a gun might go off, and in business are equally nonprogressive. The eternal clerk, messenger boy, cook, and other nonprogressive occupations are theirs. Endurance, progressiveness, discovery go hand in hand with an endocrine system that is perfect, and a canine tooth that fears not to face antagonism in any shape or form.

"The adrenodont in its structure gives us a clue to the adrenal balance of the individual. There is another characteristic of the adrenal tooth, the color. The grinding surface of such teeth shows a marked reddish brown coloration (Chayes), and although softer in texture than the thyroid or pituitary variety, they have a greater degree of endurance (Chayes). Here again is a hint of the ability of adrenal secretion to protect. Old men or women will show short teeth still in a very good state of preservation and most freely marked with this reddish brown pigment. Younger people with such teeth can be assured of their lasting character, and it is astonishing to note how some of them remain intact regardless of the lack of care and the thick wall of tartar that surrounds them. Age or the ability to grow old goes hand in hand with proper adrenal work, of course with the assistance of the other endocrines; and so adrenal markings in the form of pigment insure not only the life of the tooth but also its possessor. Individuals who become patients on account of improper adrenal work may show this peculiarity in their teeth also, the marking here indicating the gland affected as well as suggesting the proper therapeutic course to pursue.

"*Thymodontia.*—The tooth of the baby is bluish porcelain, thin at the grinding edge, and translucent in that part. The tooth in some children shows a tendency to scalloping at the grinding edge. This trait may outlast the baby and in rare occasions be found in the adult. The other infantile characteristics may go with it such as a red cheek, an excellent digestion and a tendency to diarrheas. The finding of such teeth in the adult points to the youth of the individual, regardless of years. In this persistence of juvenile characteristics, one must always weigh the compensation offered by the other glands with internal secretion.

"The purpose of this communication will have been accomplished if the physician and dentist will begin to see in the dental apparatus a greater purpose than the sole function of mastication. When fully studied upon lines suggested above, a volume of facts will be discovered that heretofore may have many times been entirely overlooked."

Dr. Kaplan calls the entire ductless gland expression as observed in various individuals "compensatory dynamics;" I feel that this term will be misleading. The action of these glands, particularly the adrenals, the thyroid, and the pituitary is dynamic to be sure, but not compensatory in the true sense of the word. If they were compensatory, surgeons might, with impunity, remove any one of the glands and expect the other one or two of them to assume the function of the one removed.

We know that this does not take place. As a matter of fact, the remaining glands will be much disturbed in their expression of function.

So close is the interdependence of these glands in their function, that not one may be hurt or tampered with, without immediately calling forth resentment in the others.

But interdependence of dynamic expression is not now and never can be compensatory dynamics, and Dr. Joseph Fraenkel and his associates, to whom most of us owe our correct information on the subject of ductless gland activity, their physiology and function, and their therapeutic use and value, never meant to, and never did, to me at least, convey the information or impression that they were compensatory in the sense in which Dr. Kaplan seems to conceive them to be.

Dr. Kaplan is correct in attributing to the ductless gland chain a marked influence upon the dental apparatus, its formation as to position and quality, hence resistance to destruction by decay. It is well established, beyond the necessity for further vague experimentation, that the breaking down of dental tissues to wit, teeth and environs, may be modified if not altogether, at least, to some considerable extent by ductless gland therapy. I called the attention of the profession to this subject about two and one-half years ago in my thesis on the functions of the teeth.

Dr. Kaplan is again hasty in his nomenclature. There is no such thing as thyrodontia or piptuitodontia or adrenodontia, etc., any more than we could improvise a science of pneumodontia or intestinodontia; a happier name for his article would have been "Endocrinodontia," because such a name would have covered the subject.

His remarks regarding the influence of the gonads upon the position of the

laterals in the superior maxillæ is correct, but that this influence is a crossed one has not been borne out in all experiences, also it must be remembered that this influence is not a direct one but is exerted through the pituitary.

Thyroidal teeth are long, well-rounded, bell-shaped, and of a beautiful bluish white texture shading into yellow at the cervical margin.

Pituitary teeth are short or long, not so bell-shaped, more or less square-shaped anteriors are the rule, yellowish gray in color.

Adrenal, or so-called adrenal, teeth are small bell-shaped organs rapidly yielding to attritional wear, occlusal surfaces show reddish stains, they resist decay remarkably well, are yellowish white in color, quite yellow at the cervical margin. Erosion of teeth at cervical portions is, to my mind, an adrenal phenomenon and manifests itself in many cases which are potentially neoplasmic. The same is true of teeth which seem to possess an inherent principle of immunity.

Thymic teeth may be thyroidal or pituitary in character with the addition of scalloped, fan-shaped occlusal or incisal surfaces. They are very translucent and of a milky white or bluish white color.

May we not conclude from all the foregoing that:

When a little child presents himself to us and the little one's teeth are in malrelation to one another, we ought to know how to correct this situation without harnessing this little masticating apparatus in all sorts of unspeakable and distressing appliances, furthermore, we ought to realize that this very malrelation of the teeth is an expression of a constitutional state to be ministered to, not by irritating the structures in the mouth, but by gently recalling to its proper sphere of activity and supervision, the delinquent part of the mechanism, the temporary aberration of which caused the malrelation—a thymopituitary state.

When a little one whose teeth decay readily, despite all attention to hygiene, presents himself to us for our attention and aid, we should so minister to the potential man or woman in it as to recall to its proper sphere of activity and supervision, the delinquent part of the mechanism, the temporary aberration of which caused the dystrophy—a thymothyroidal state.

When a little patient whose posterior teeth are in malrelation and show reddish stains on the occlusal surfaces, presents himself to us for attention, we should be able to recognize an expression of a thymopituitoadrenal stress and so minister to the little one as to recall to their proper sphere of activity and supervision the delinquent parts of the mechanism, the temporary aberration of which caused the dystrophy.

When a little patient whose teeth in the premaxillary region of the maxillæ are in malrelation presents himself, we should recognize this as a prenatal pituitary state and so minister to the little one as to recall into proper sphere of activity and supervision, the delinquent part of the mechanism responsible for the particular expression.

When a little patient whose lower anterior teeth are in malrelation, presents himself, we should recognize this as a postnatal pituitary state and so minister to the little one as to recall to harmonious interplay the delinquent part of the mechanism, answerable for the particular expression.

A little child who presents himself with its upper laterals in torsion, is possessed of some gonadial disbalance, indicating, perhaps, a senile gonadial apparatus, a prenatal pituitogonadial state and should be so treated as to recall, if possible to proper sphere of activity and supervision, that part of the mechanism, answerable for the particular expression.

These few paragraphs may be summed up in the following sentences:

First, dentition as to time, is a thymopituitary function.

Second, dentition as to position, is a thymopituitary and gonadopituitary function.

Third, dentition as to quality is a thyropituitary function.

Fourth, dentition as to resistance is a thyroadrenal function.

It follows from this that the first permanent molar erupts in normal position in the upper arch when the thymothyroidal apparatus is in balance and when there is no prenatal pituitary disturbance.

It erupts in normal position in the lower arch when the thymothyroidal apparatus is in balance and when there is no postnatal pituitary disturbance before six years of age. The above holds true in sequence mentioned for the upper and lower temporary set of teeth.

The bicuspids and second permanent molars and cuspids are most often in malrelation in females, because they erupt at a time of or immediately after puberty or at a period when the pituitary is called upon to adjust itself to and to interplay with the awakened gonadial apparatus, a critical time in the life of a female individual. The same holds true in a male person but to a lesser degree.

The torsion of the permanent laterals indicates an anomaly of the uterus as to position or some ovarian difficulty in the female and some testicular disturbance in the male. When the torsion is very decided in the latter, one may safely assume the presence of a varicocele in the patient.

If the permanent cuspids are forced out of position by apparent lack of space, they point in females to ovarian disturbance such as cysts, fibroids, etc. In males they are an indication of recurrent obscure pains in the lower abdominal region with sensitive areas in the region of the groins.

If these cuspids are markedly prehensile in formation, they indicate an abundance of the sexual urge as mentioned in a previous chapter of the book.

Individuals whose teeth suffer from erosin at the cervical margins and upon the labial surfaces and which present an enamel surface which is highly polished and of a greenish white hue bid fair to be candidates for neoplasms, particularly so when red-haired.

The spacing of the anterior upper teeth is a pituitary signature and often tells a story of headaches, constipation, and other gastric disturbances.

Teeth, which have undergone marked change in macroscopic appearance due to attrition, invariably tell, in dark people, a story of freedom from infectious diseases, outside of perhaps measles and diphtheria or whooping cough, but also point to the predisposition of the person to disturbances of a circulatory nature and afflictions of the lower portion of the large intestines.

We see cases of mature age which present teeth of marked youthful appearance. We call them thymic teeth and they tell a story of a pituitary and

gonadial battle against a powerfully entrenched thymus, resulting in a compromise, definitely expressed in an occlusal relation between upper and lower teeth which permits of the virtual perpetuation of the incisal and occlusal surfaces characteristic of children's teeth.

I am convinced that a deep study of the endocrines and a careful therapeutic application of them, would, to a great extent, if not altogether, eliminate the endless dystrophies manifesting themselves in the oral cavity; and thus obviate the call for a great number of tedious, and for patients, very painful operations.

I appreciate the fact that many will read this chapter with great skepti-

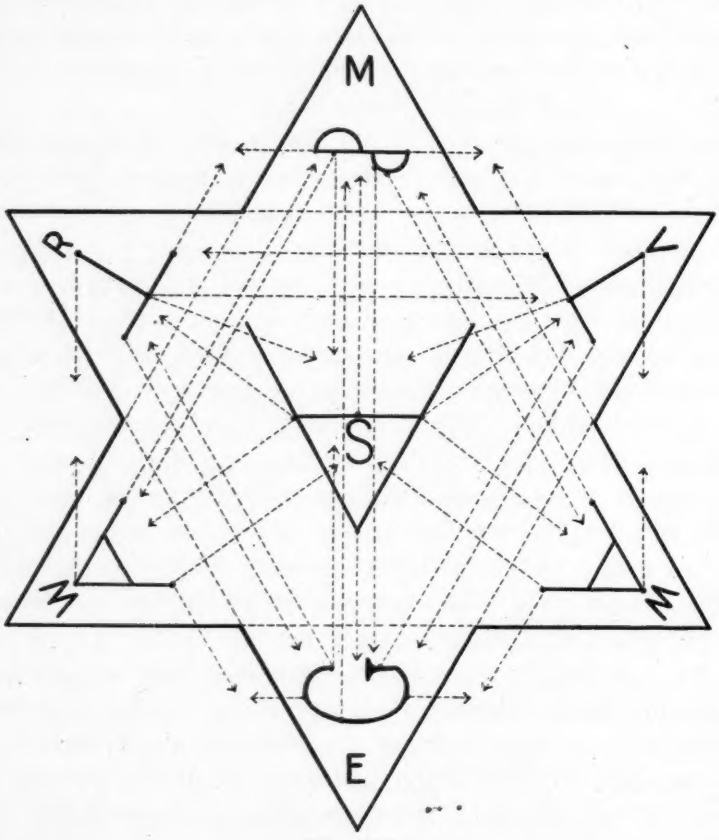

Fig. 372.

cism, and I can readily understand why this will be so; but I would ask these readers to abide in faith and read some of the books to be recommended and then carefully observe their patients, question them at length and so learn from their own daily practice to understand the wonderful interdependence which exists between the endocrines and the dental apparatus and how perfectly they express themselves in the size, texture, quality, and position of the teeth and their environment.

THE CREATIVE FORCE AT WORK

In the accompanying diagram (Fig. 1) two triangles are seen superimposed one upon the other, making a six-pointed star—the Protector of David. It represents the conception I have of the Universal Spirit or Mind or Soul work-

ing upon itself and expanding in consciousness from within outward, so that it begins to manifest itself in various ways on different planes (creation).

The fact that these triangles are so placed that one presents with its apex downward and the other with the apex upward, will mean much to those who have studied occultism and are familiar with the literature on symbolism.

We see here the large *A* in the center of the illustration. In the apical portion of the *A* we see an *S* to represent the Sun, the energizer, the father, he, who with his warmth, animates the Universe. Directly above, we see the point of the star marked *PP* representing the pituitary beneath which rests the pineal. Within this point of the star, the *M* represents the Moon with its psychic significance to man.

The point on the upper left marked *T* represents the thyroid and the *R* within it stands for the restless, ever-moving atmosphere.

The point on the right, also marked *T* represents the thymus or youth or beginning of man. The *V* within this point represents the vegetable kingdom, even as the *R* in the opposite point represents the mineral kingdom with its finely-divided silicious and other mineral particles floating in the ether. This *V* representing the flowers and trees and leaves upon the trees is symbolic of ever-recurring youth.

The two points below, the right and left *A* represent the adrenal bodies or energy made manifest on the human plane. The *W's* within these points represent the waters of the earth.

And finally, the point below marked *G* for gonads, expressing immortality on the procreative plane. The *E* within this point represents earth or the place where man must reach a certain stage in his unfoldment in order to be worthy of his Creator.

Please note the number of intercommunicating lines along which impulses or hormones or whatever we may choose to call them may travel.

If we now look upon the large central *A* as the heart of man we shall have a picture of him as the microcosm within the Universe and we may note how the adrenal, the pituitary, the pineal, the thyroid, the thymus, and the gonads all have their heart valency and how conversely the heart presents its radiant impulses impartially to all of them.

The vast influence of these glands may be further graphically illustrated by lines or arrows going from the six points of the star to all parts of the body. Such as skin, hair, teeth, muscles, ligaments, lungs, liver, bowels, eyes, ears, nose, throat, that is, pharynx, larynx, tonsils, etc.

The net work is so vast and the interdependence so intimate that it would require a volume of considerable size to cover the subject.

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PYORRHEA ALVEOLARIS IN RELATION TO SYSTEMIC DISEASE

By Wm. W. Duke, M.D., Ph.B., Kansas City, Mo.

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PYORRHEA alveolaris is rarely due to one cause alone. In an overwhelming majority of cases it is due to one chief cause and several important contributing causes. The more important causes are mechanical conditions which expose the gums repeatedly to injury or to the irritating effects of putrefying food material, secretions, etc.; systemic or local conditions which increase the susceptibility of the gums to infection and finally infection itself. The successful treatment of pyorrhea depends upon the removal of each abnormal condition which takes part in its etiology.

CAUSES OF PYORRHEA ALVEOLARIS

1. Microorganisms; streptococcus group, pneumococcus group, staphylococcus group, amebæ, spirochetæ, and fusiform bacilli of Vincent's angina, bacilli of many types, putrefactive organisms, etc.

2. Chronic irritation or trauma, such as that caused by tartar, decay, malocclusion, defective dental work, and, perhaps, in rare instances, by the improper use of toothpicks, toothbrushes, etc.

3. Unsanitary conditions, such as may be caused by pockets and irregularities of the teeth which make possible the lodgement and putrefaction of secretions, food materials, etc. Such may occur as a result of defective dental work, tartar, decay, irregularity of the teeth, etc.

4. Conditions which prevent the normal massage of the gums and cleaning of the teeth by the excursion of food, the tongue, and cheeks during the process of mastication; namely, malocclusion, irregularity of the teeth, and defective dental work.

5. Constitutional conditions which increase the susceptibility of the gums to infection; namely, diabetes, pregnancy, lactation, alcoholism, lead poisoning, the use of mercury and potassium iodide in therapy, chronic debilitating diseases, blood diseases, anemia, etc., diseases of the ductless glands, scurvy, acute infectious diseases, chronic infections, such as infected tonsils, alveolar abscesses, infected nasal sinuses, chronic appendicitis, cholecystitis, etc.

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The above factors vary in their relative importance, and each factor varies in its degree of importance. Several factors play a part in the majority of cases. When this is the case, relatively unimportant factors may play important roles. For example, acute trauma, such as that brought about by injury or by the use of toothpicks, stiff toothbrushes, etc., seldom or never causes pyorrhea in normal individuals with normal teeth, in fact, stiff brushes are used in prophylaxis against pyorrhea. In a patient with diabetes, however, or in preg-

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Figs. 1-4.—Illustration showing a normal condition of roots and alveolar process. Figs. 1 and 2, in adult life. Figs. 3 and 4, before eruption of second teeth.

Fig. 5.

Fig. 6.

Figs. 5 and 6.—Osteomyelitis of the jaw derived from an infection at the roots of a molar tooth which were extracted before the roentgenogram was taken.

nant women, acute trauma may initiate an infection of the gums, especially if, in addition to this, the patient has tartar or defective dental work. Likewise, the irritating effect of defective dental work which might be well tolerated by a normal individual might be a source of severe pyorrhea in an individual taking intensive doses of mercury or potassium iodide, or in an individual with irregular teeth having accumulations of tartar, etc.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Figs. 7-10.—Case of pyorrhea alveolaris of long standing. Shows great destruction of the alveolar process.

Fig. 11.

Fig. 12.

Fig. 13.

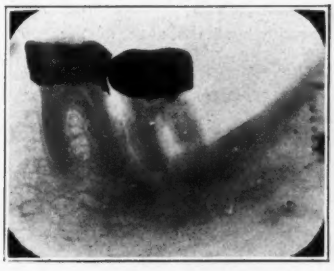

Fig. 14.

Figs. 11-14.—Illustrations of cases in which the alveolar process has been so destroyed by infection that some of the teeth are held in place by soft tissues alone. Pressure on such teeth during mastication forces them down on cushions of chronically infected tissue. They would appear a greater menace to health than infected teeth whose roots are still embedded in bone and held in place more firmly. The teeth shown in Figs. 13 and 14 had been treated for two years by a pyorrhea specialist. The surface of the gum was pink and appeared relatively healthy. Marked relief of systemic complaint followed the extraction of teeth in each of the cases illustrated above.

As previously mentioned, the majority of individuals with pyorrhea show the presence of two or more causative factors. Unfortunately, in many instances, numerous factors can be found. The real reason for this becomes apparent if the causative factors are traced to their sources of origin. For example, enlarged tonsils and adenoids are common causes of mouth-breathing in children. Mouth-breathing is a common cause of malocclusion and irregularity of the teeth. Malocclusion interferes with the self-cleansing of the teeth, prevents the normal massage of the gums, and allows the accumulation of tartar. The unsanitary conditions caused thereby predispose to decay and make dental work necessary. Decay, tartar, and dental work are the most frequent causes of pyorrhea. Individuals who have been mouth-breathers by reason of hypertrophied tonsils and adenoids are likely, therefore, to have, not only defective

Fig. 15.

Fig. 16.

Figs. 15-16.—Pyorrheal abscesses. These teeth are held more firmly in place by the remains of the alveolar process than those shown in illustrations 11 to 14.

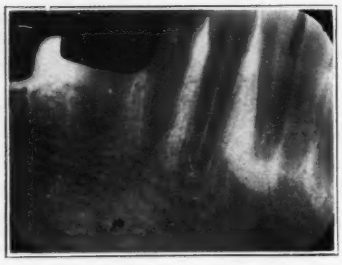

Fig. 17.

Fig. 17.—Abscess at the root apex of a vital tooth. Tooth responded to all tests for vitality of pulp. The infection was derived from the gum margin. The anterior table of the alveolar process had been eroded as far down as the apex of the root.

teeth which are prone to cause pyorrhea, but also hypertrophied infected tonsils which may lower resistance to infection and which in this way increase the susceptibility of the gums to infection. Such individuals are also likely to have one or more systemic diseases as a result of acute or chronic tonsillitis, which may cause an additional lowering of resistance. All of the above factors singly or combined may play important parts in the pathogenesis of pyorrhea. In the average medical case, not one, but several predisposing factors can usually be found.

Infection is seldom or never a sole cause of pyorrhea. Pyorrhea would seem theoretically impossible, however, without infection as a primary cause. Malocclusion, defective dental work, etc., might cause pressure atrophy of the

gum and alveolar process, but could never cause the chronic inflammatory changes of pyorrhea unless infection were superimposed.

The *microorganisms* found in septic pockets about the teeth are numerous and varied. If the superficial pus in pyorrhea pockets is removed and examined, a great variety are found coexisting; namely, streptoccocci, pneumococci, diplococci, staphylococci, bacilli, spirochetes, and amebæ, of various sizes and strains. If the superficial pus is wiped away and a culture or smear is taken from the deeper areas, the members of the streptococcus and staphylococcus group are found most constantly. Streptococci usually predominate in numbers and are often in relatively pure culture. Streptococcus viridans, streptococcus hemolyticus, and amebæ can be demonstrated in almost every case, and a few colonies of staphylococcus aureus and albus in the majority of cases.

It seems improbable that any individual organism plays a specific role in

Fig. 18.

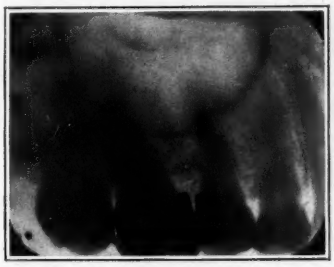

Fig. 19.

Fig. 20.

Fig. 21.

Figs. 18-21.—Illustrate the ill effect upon the alveolar process of careless dental work.

the pathology of the disease. Many of the organisms which can be isolated are pathogenic and capable of causing acute or chronic inflammatory change in many tissues under favorable conditions. One doubts, however, if any of them ever gain a foothold in the tissues of a normal healthy gum, and cause local disease unless the resistance of the gum against infection is lowered by some coexisting abnormal condition. In fact, one might be justified in believing that if a pure culture of bacteria obtained from a case of pyorrhea were applied directly to the gum, the bacteria would probably be washed away and killed by the secretions of the mouth, and do no harm unless the gum had been previously rendered susceptible to attack by local injury, lowered resistance, or both combined.

A spirillum associated with a fusiform bacillus found in great numbers in Vincent's angina is perhaps worthy of special mention. These organisms are

found in small numbers in pus expressed from pockets about the teeth and tonsils in normal individuals. They are occasionally found in overwhelming numbers and in almost pure culture in cases of severe rapidly advancing pyorrhea. This type of disease may progress with great rapidity, and may cause rapid destruction of the soft parts and alveolar process even in patients with relatively normal teeth and gums. It is more commonly observed, however, in individuals in whom irregularity of teeth, tartar, defective dental work, or careless habits render the mouth unsanitary. This disease usually yields rapidly to local treatment.

The presence of amebæ can be demonstrated in the vast majority of chronic lesions of the gum. They are often present in great number, especially in the deeper pockets. This discovery led Bass and Johns to suggest the use of emetine in the treatment of pyorrhea. It is difficult to determine whether or not

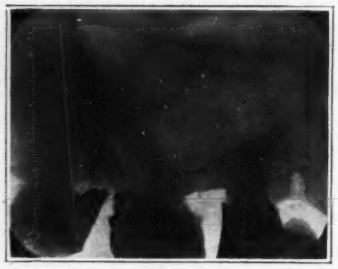

Fig. 22.

Fig. 23.

Fig. 24.

Figs. 22-24.—Illustrate the ill effect upon the alveolar process of careless dental work.

amebæ play an important role in the pathology of pyorrhea or whether they are harmless secondary invaders. It appears true, however, that emetine has a certain limited sphere of usefulness in therapy. Its effect is not permanent, however, unless the mechanical and sanitary condition of the mouth is properly cared for.

Temporary trauma, such as might be caused by an acute injury or by the use of toothpicks or toothbrushes and by the irritating effects of tobacco, is perhaps never in itself a cause of pyorrhea in healthy individuals with regular, clean teeth. Temporary trauma may be a contributing cause of minor importance, however, in patients with unsanitary oral cavities.

Chronic irritation and repeated trauma of the gum, and unsanitary conditions due to tartar, decay at the gum margin, poorly constructed fillings, crowns and bridges, malocclusion, irregularity of the teeth, etc., are among the

most important and most frequently observed causes of pyorrhea alveolaris. If teeth were all regular and kept clean, and if dental work was always properly constructed, pyorrhea would be a relatively rare disease.

Pyorrhea due to the above causes is likely to occur in localized areas of infection at first. It is found frequently under defective fillings, crowns and bridges, and in such locations there may be extensive destruction of both gum and alveolar process. Later the infection is likely to become more general.

Fig. 25.

Fig. 26.

Fig. 27.

Fig. 28.

Fig. 29.

Fig. 30.

Figs. 25-30.—Illustrations show deposits on neck of roots. In some instances there appears to be bone proliferation of the root due to chronic irritation of the peridental membrane just below the gum margin.

It hardly comes within the scope of a medical man to say more concerning this purely dental problem.

Lowered resistance to infection has an important bearing upon the development of pyorrhea. Dentists who neglect this factor are likely to have a number of failures in their efforts to cure pyorrhea. Resistance may be lowered

by the following diseases to such an extent as to render the gums abnormally susceptible to infection:

First, by constitutional conditions, such as diabetes, pregnancy, lactation, alcoholism, debilitating diseases, blood diseases, anemia, diseases of the ductless glands, lead poisoning, and scurvy, and by the therapeutic use of mercury and potassium iodide. It is well known that pyorrhea frequently starts and advances rapidly during pregnancy and lactation, especially in individuals with defective and unsanitary oral cavities; also that pyorrheal sepsis, like other

Fig. 31.

Fig. 32.

Fig. 33.

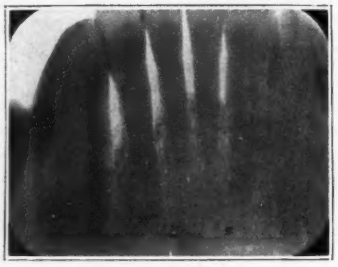

Fig. 34.

Fig. 35.

Fig. 36.

Figs. 31-36.—Typical example of oral sepsis in a patient with a great deal of dental work. Hardly a tooth can be found which is not the site of infection. Note the exostoses of the roots shown in Fig. 31 due to chronic irritation of the peridental membrane.

forms of sepsis, is likely to occur in patients with diabetes, anemia, etc. The reason is that the defensive mechanism in patients with these conditions is definitely reduced in its power to combat infection so that they become fit subjects for pneumonia, tuberculosis, furunculosis, pyorrhea, and other infections. Such patients may combat infection normally if the systemic condition is relieved. A case of acute superficial pyorrhea observed in a patient with diabetes who had

regular, normal teeth, cleared up without local treatment a few days after the urine was rendered free from sugar.

Second, resistance against infection may be lowered by infection. It may be lowered by the more localized infections, such as tonsillitis, alveolar abscesses, infected nasal sinuses, cholecystitis, appendicitis, etc., and by the more generalized infections such as typhoid fever. The bearing which infection in distant organs may have upon the development and course of pyorrhea is important and often striking. Pyorrhea is sometimes noticed first or apparently cured cases recur soon after an attack of tonsillitis, or after the development of an acute alveolar abscess, or after a sinus or gall bladder infection. This is especially true of individuals with unsanitary mouths. It may be attributed to the fact that resistance is lowered by the acute infection to such an extent that the organisms about the teeth flourish, invade the tissue of the gum and cause local inflammation. Analogous examples of exacerbation or recurrence of apparently healed inflammatory processes after the development of acute infections are commonly met with in the practice of medicine. It is a common occurrence, for example, for latent tuberculosis to become active after an attack of bronchitis or acute tonsillitis. Chronic appendicitis, cholecystitis, or a chronic latent Neisser infection may undergo an acute exacerbation during or following acute bronchitis or tonsillitis. Urethritis that has been clinically well for months has been known to recur after an attack of la grippe. A healing furuncle may discharge more pus or the scars of recently healed furuncles may itch, become red and even discharge pus after the development of a fresh furuncle or after an attack of tonsillitis. A patient we observed who had specific disease which had been latent for four years had an extensive papillary brown-red rash and gave a positive Wassermann test one week after recovery from typhoid fever.

The above examples are mentioned to illustrate the fact that resistance against infection may be lowered by infection. It may be lowered either by focal infections or by the more widespread infections. For this reason, alveolar abscesses, chronically infected tonsils or adenoids, infected nasal sinuses, chronic appendicitis, chronic cholecystitis, and other chronic infections may be insurmountable obstacles to the permanent cure of pyorrhea by local treatment alone. The gums may improve and remain healthy so long as the teeth are kept scrupulously clean and free from tartar, but so soon as the hygiene of the mouth is neglected and resistance is lowered by fatigue, exposure to cold, indulgence in alcohol, etc., increased activity of some chronic infection may cause a further lowering of resistance and the lighting up of a latent infection of the gums. Chronic foci of infection are frequently contributing causes of pyorrhea and frequently render its permanent cure difficult.

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EDITORIALS

The Need of a National Dental Board of Registration

FOR a number of years a few men in the dental profession have realized that the present plan of registration of dentists by individual state boards does not possess all of the advantages that are desired by the profession as a whole. Under the present conditions, the registration of dentists is controlled by the state board of each state, with the result that a man may be qualified to practice dentistry in one state, and by not fulfilling requirements of the board in another state, he is prevented from going to a different field to practice, although conditions seem more favorable for him to make the change.

We realize that according to the present law, each state can make whatever restrictions it desires in regard to the registration of men engaged in the practice of dentistry. This is based upon the old question of "state rights," but we believe that such important bodies as the medical and dental profes-

sions should not be subservient to the individual "state rights" or state laws, but should be governed by a national dental board of registration which would have the same plan, laws, and regulations governing the entire medical and dental professions of the United States. We are aware of the fact that under certain conditions state boards have made concessions under the term of "reciprocity," which have some advantages and which have a great many disadvantages. There are certain states in the Union that are very much opposed to dentists from any other locality coming to those states to practice. In such states we find the dental boards have refused to make reciprocal arrangements with other boards. In fact, the state dental board has taken upon itself the function of protecting the men registered in the state against too large a number of men being engaged in the practice of dentistry. In some instances state boards have attempted to build up lines of restriction which would prevent anyone from being permitted to practice in the state unless he is a native son or graduate from a certain school. This may be a satisfactory arrangement so far as the men already registered in the state are concerned, but it is a very small, selfish, and unsatisfactory plan in relation to the dental profession of the United States as a whole.

Again we see the need of a national dental board of registration as a result of conditions which have been produced by the war. We find men in the dental profession, from all localities who have given their service to the country, with the result that there are a great many dental offices vacant, and in some communities the number of dentists has been so decreased that there are not enough left to take care of the public. We find some instances where a man who joined the army has been desirous of having some one in his office to take care of his practice while he is away, and the man he desired to bring into the office is not registered in that state. Consequently, his dental practice has been left without anyone to take care of it, simply because the dental laws of the United States are so arranged that a man who is registered in one state is not permitted to occupy an office in another, even though the man who owns the original office is rendering a service to the country by giving his time to the army or navy.

We have known of several instances in which men engaged in the practice of orthodontia have given up their practice to join the army, and have attempted to get orthodontists from other states to take care of their practices while they were gone; but, of course, were prevented from doing so by the state boards. These men who have given their services to the country may be away from their offices for a number of years; and as a result of having no one in the office, their practice will be in bad shape when they return.

In other instances men in the army and navy may desire to change their location when they return to civilian practice due to the fact that it will be practically as easy to build up a practice in one locality as it will be to build up a practice by returning to their old location. We believe that out of fairness to those men who have given their service to the country, some provision should be made whereby they can locate in any community they desire, even though it be in a different state than the one in which they formerly practiced. We realize this matter is going to be very difficult to arrange with the present

system of individual state boards. With a national dental board the matter could be very easily arranged. We have never been able to see why a man who is qualified to practice dentistry in one state is not qualified to practice in another. The only possible reason we can find for the existence of a number of state boards is the old question of state rights, plus the fact that each individual state board has a very exalted opinion of itself and believes it occupies a very important position in the dental profession, along with the political preference which the board gets by its existence.

We believe a great step will be made in the advance of the dental profession as a national institution when state boards are eliminated and the registration of dentists is placed under one national board and probably controlled by the Surgeon-General's office. We have given this matter much thought in times past, and can come to no other conclusion except that a national board of registration will be a decided advantage over the present plan of individual registration in each state by local state boards. We hope that we may see the time when such a board will be a certainty, and in existence, rather than a need and a desire.

Cast Inlay Suit Lost by Plaintiff

ANOTHER chapter has been written in the case of the cast inlay patents, which has been a vital question before the dental profession for a number of years. Over three years ago suit was filed in Chicago against 535 dentists, and injunctions were obtained against about 118. Some of these men were prevented from making inlays entirely, while others had to file a $500 bond during the decision of the case. As a result of these suits, the Dentists' Mutual Protective Alliance was organized to contest the patent. After being in court over three years, a decision has been handed down which is a complete victory for the Alliance, and the court has failed to grant the plaintiff any of his contentions. The case involved 43 claims made on four different patents, and the court fails to grant any of these claims.

In contesting a patent, in order to render it invalid, evidence must be shown that the particular thing was not new at the time the patent was obtained. In order to substantiate its claims, the Alliance presented four different cases to show that cast inlays had been made according to the method patented before the patents were granted. In handing down the decision, the court only mentions one case, that of Dr. Philbrook, of Iowa, against which the plaintiff's attorney offered no evidence. By this action the attorney practically admitted that Dr. Philbrook did what he said he did at the time mentioned. Consequently, in handing down a decision, the court selected only this one case, as it was sufficient evidence to show that inlay patents were invalid according to priority.

The litigation in this suit has been very expensive; however, should other suits be filed in different districts, they can be defended for a much less amount, due to the fact that the court has selected the Philbrook case as sufficient evidence to prove that inlay patents do not include anything new and original. Should suit be filed against a member of the Alliance in another district, it can

be defended for a comparatively small sum compared to what the three years' litigation has cost the Alliance in the present case.

The importance of this decision to the dental profession is probably very little appreciated, and the fight that the Alliance is making for the profession did not receive the support to which it was entitled. As a result of this decision, the dental profession has been saved at least $5,000,000, besides enormous amounts of trouble involved in suits, injunctions, and possibly jail sentences. The decision of the court in this district will not prevent the filing of suits in other districts, therefore, there is still a need for the Dentists' Mutual Protective Alliance, and still a need for members to protect themselves against the inlay patents, as well as similar conditions which may arise in the future.

The plaintiff's attorney has a few weeks in which to appeal the case; and, due to the enormous amount involved in royalties, it is very probable that the case will be appealed and carried to a higher court. However, from the complete evidence submitted, we can see very little chance for reversal by a higher court.

The X-Ray in Dentistry

DENTAL practitioners are frequently heard to remark that the practice of modern dentistry has become so very exacting, and the responsibilities of failure so great, that all pleasure in the conduct of a dental practice has completely vanished. It is argued that a thoroughly conscientious dentist, in the light of present day knowledge, carries a heavy burden because of the possibility of a patient being dismissed with local dental foci of infection, which may result in very serious illness or even death. Observation, however, leads to the conclusion that many who are thus "worried," have almost entirely ignored that most important dental office requisite, the x-ray. Little wonder the conscience is troubled, because of the uncertainty of results and the knowledge that every known device has not been used to render the most skillful service possible.

We make no extravagant claims for the shadow-picture machine. It is not infallible. But for checking up root canal treatments and fillings, it is, to our mind, quite indispensable. What justification has any dentist for charging a patient for the most skillful service, and yet continue filling root canal after root canal, without knowing they are properly filled, and failing to take advantage of every possible means to learn the facts?

Those dentists who regularly use an x-ray machine have established a new and better standard of service. The conscious knowledge of having rendered the best possible service, results in the real joy and pleasure, without which dental practice is nothing but a grind. The practice of dentistry today certainly involves greater responsibilities, but it also involves better service and more satisfying results. If an x-ray machine were used for nothing else than producing skiagraphs of root canal fillings, it would more than justify its use, in pleasure and satisfaction to the dentist.

At the outset, the x-ray should be recognized as a dangerous machine when in the hands of a careless or ignorant operator. Before undertaking its use the

operator should give special study to the whole subject and thoroughly master the technic of operating the particular machine employed.

It should also be recognized, that if an intelligent conclusion is to be arrived at, the significance of varied degrees of shadows, or the absence of shadows, are not of themselves to be taken as conclusive diagnostic evidence, but must be considered along with all of the clinical facts in the case. In other words the x-ray, while a most valuable aid to diagnosis, is only one of the links in the evidence, and is only of value when considered as such.

For diagnosis, studying rarefied areas, and the intelligent practice of modern dentistry, the x-ray has made for itself a permanent place in dentistry. Why not recognize the fact before your patients commence asking you,—Why?—*Oral Health.*

National Association of Dental Faculties

The next annual meeting of the National Association of Dental Faculties will be held in the Green Room of the Congress Hotel, Chicago, Ill., August 2d, at noon. The executive committee will meet at 10:00 A.M. on the second. The meeting will continue through August 3rd.

N. W. corner 10th and Troost, Care K. C. Dental Col.

CHARLES CHANNING ALLEN, *Sec.*, Kansas City, Mo.

Meeting of American Society of Orthodontists

The eighteenth annual meeting of the American Society of Orthodontists will be held August 1, 2 and 3, at the Edgewater Beach Hotel, Chicago, Ill. This will be an excellent meeting. It is advisable to make your reservations early.

Applied Anatomy and Oral Surgery for Dental Students*

THE second edition of this valuable work by Dr. Ivy follows out the same plan as the first edition which begins with a chapter dealing with the subject of applied anatomy. The work is extremely valuable from the standpoint of the student, owing to the fact that there is a set of questions at the end of each chapter which is of great assistance to some in studying the text.

Chapter I deals with the study of the various bones of the head and the face from a surgical standpoint. The muscles, blood vessels and nerves are taken up in a similar manner and the description of each is very concise and complete.

There are also chapters dealing with inflammation, surgical fever, shock, collapse, hemophilia and anesthesia. The work to a certain extent is a combination of pathology and surgery which makes it very valuable to dental students, and we know of no book which would fill such an important place in dental education and no work whereby the student can obtain as great an outline of the subject in so short a time as can be obtained by Ivy's "Applied Anatomy and Oral Surgery."

*Applied "Anatomy and Oral Surgery," 2nd edition, thoroughly revised by Robert H. Ivy, M.D., D.D.S., Assistant Surgeon, Columbia Hospital, Milwaukee. Former Assistant Surgeon, Pennsylvania Hospital, Former Instructor in Oral Surgery, University of Pennsylvania. Second edition, 290 pages, illustrated, published by W. B. Saunders Co., Philadelphia and London, 1917. Price cloth, $1.75.